IPv6 Ready

DHCPv6 Interoperability Test Specification

Technical Document

Revision 2.0.0e

IPv6 Forum *http://www.ipv6forum.org*
UNH InterOperability Lab (USA) *http://www.ipv6ready.org*
TAHI Project (Japan)

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Acknowledgements

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Introduction

The IPv6 forum plays a major role to bring together industrial actors, to develop and deploy the new generation of IP protocols. Contrary to IPv4, which started with a small closed group of implementers, the universality of IPv6 leads to a huge number of implementations. Interoperability has always been considered as a critical feature in the Internet community. Due to the large number of IPv6 implementations, it is important to give to the market a strong signal proving the interoperability degree of various products.

To avoid confusion in the mind of customers, a unique logo program has been defined. The IPv6 logo gives confidence to users that IPv6 is currently operational. It is also a clear indication that the technology will still be used in the future. This logo program contributes to the feeling that IPv6 is available and ready to be used.

Definitions

DAD	Duplicate Address Detection (DAD)
DHCP	Dynamic Host Configuration Protocol
DUID	DHCP Unique Identifier
IA	Identify Association
ID	Identifier
TN	Testing Node
TR	Test Router
TAR-XX	Target Device
REF-XX	Reference Device
Client	DHCPv6 Client Device
Server	DHCPv6 Server Device
Relay-Agent	DHCPv6 Relay-Agent Device

Test Organization

This document organizes tests by group based on related test methodology or goals. Each group begins with a brief set of comments pertaining to all tests within that group. This is followed by a series of description blocks; each block describes a single test. The format of the description block is as follows:

Test Label	The **Test Label** is the first line of the test page. It will have the following form: DHCPInterop .A.B Where each component indicates the following: DHCPInterop –Test Suite Identifier A – Group Number B – Test Number Scripts implementing this test suite should follow this convention, and may also append a character in the set [a-z] indicating a particular test part.
Purpose	The **Purpose** is a short statement describing what the test attempts to achieve. It is usually phrased as a simple assertion of the feature or capability to be tested.
References	The **References** section lists cross-references to the specifications and documentation that might be helpful in understanding and evaluating the test and results
Test Setup	The **Test Setup** section describes the configuration of all devices prior to the start of the test. Different parts of the procedure may involve configuration steps that deviate from what is given in the test setup. If a value is not provided for a protocol parameter, then the protocol's default is used for that parameter.
Procedure and Expected Behavior	The **Procedure and Expected Behavior** table contains the step-by-step instructions for carrying out the test. These steps include such things as enabling interfaces, unplugging devices from the network, or sending packets from a test station. The test procedure also cues the tester to make observations of expected behavior, as needed, as not all steps require observation of results. If any behavior is expected for a procedure, it is to be observed prior to continuing to the next step. Failure to observe any behavior prior to continuing constitutes a failed test. Note, that while test numbers continue between test parts, each test part is to be executed independently (Following Common Test Setup and Cleanup as indicated), and are not cascaded from the previous part.
Possible Problems	The **Possible Problems** section contains a description of known issues with the test procedure, which may affect test results in certain situations.

References

The following documents are referenced in these texts:

[DHCPv6] T. Mrugalski, M. Siodelski, B. Volz, A.Yourtchecnko, M. Richardson, S.Jiang, T.Lemon, T.Winters, Dymanic Host Configuration Protocol for IPv6 (DHCPv6) , RFC 8415, November 2018.

[ICMPv6] Conta, A., S. Deering M. Gupta, Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification, RFC 4443, March 2006.

[RFC-3646] R. Droms, Editor, DNS Configuration options for Dynamic Host Configuration Protocol for IPv6, RFC 3646, February 2003.

General Node Requirements

To obtain the IPv6 Ready Logo for DHCPv6, the client, server and relay-agent must satisfy all of the following requirements.

Equipment Type

There are three possibilities for equipment types:

DHCP client:

A node that initiates requests on a link to obtain configuration parameters from one or more DHCP servers.

DHCP relay-agent:

A node that acts as an intermediary to deliver DHCP messages between clients and servers and is on the same link as the client.

DHCP server:

A node that responds to requests from clients and may or may not be on the same link as the client(s).

Interoperable Device Requirements

Each applicant must be tested against other devices according to the following (All Vendors MUST be different):

1. Client Application
    a. Must be tested against 2 Servers and 2 Relay-Agents
2. Server Application
    a. Must be tested against 2 Clients and 2 Relay-Agents
3. Relay-Agent Application
    a. Must be tested against:
        i. 2 Clients, 2 Servers, and 2 Relay-Agents
    b. 4 Different vendors are required, the vendor in each device type must be different.

Advanced Functionality Tests

The following list of features are considered advanced functionality for DHCPv6 clients and servers. If the feature is not supported by the TAR-Client or TAR-Server, then the corresponding test cases may be omitted.

Mandatory Features for DHCPv6 clients and servers (Must select at least one)

- Supporting address assignment via IA_NA (DHCPInterop.1.1a/c, DHCPInterop.1.2a/c, DHCPInterop.1.3a/c, DHCPInterop.1.4, DHCPInterop.1.5a, DHCPInterop.1.6, DHCPInterop.1.7b/f, DHCPInterop.1.8b/f, DHCPInterop.1.9b/f, DHCPInterop.1.12a/c, DHCPInterop.1.13a, DHCPInterop.1.14, DHCPInterop.2.1a/b, DHCPInterop.2.2a/c/e, DHCPInterop.2.3, DHCPInterop.2.4a/c, DHCPInterop.2.5a/c, DHCPInterop.2.6)
- Supporting prefix delegation via IA_PD (DHCPInterop.1.1b/c, DHCPInterop.1.2b/c, DHCPInterop.1.3b/c, DHCPInterop.1.5b, DHCPInterop.1.12b/c, DHCPInterop.1.13b, DHCPInterop.1.14, DHCPInterop.2.1c/d, DHCPInterop.2.2b/d/f, DHCPInterop.2.4b/c, DHCPInterop.2.5b/c)

Other Advanced Features for DHCPv6 clients

- Transmitting DHCPv6 Confirm Messages (DHCPInterop.1.6, DHCPInterop.1.7b, DHCPInterop.2.3)
- Transmitting DHCPv6 Release Messages (DHCPInterop.1.7e, DHCPInterop.2.4)
- Processing DHCPv6 Reconfigure Messages (DHCPInterop.1.7g, DHCPInterop.2.2c/d/e/f)
- Transmitting Rapid Commit Option (DHCPInterop.2.5)
- Processing DNS Options (DHCPInterop.2.6)

Other Advanced Features for DHCPv6 servers

- Transmitting DHCPv6 Reconfigure Messages (DHCPInterop.1.7g, DHCPInterop.1.8g, DHCPInterop.1.9g, DHCPInterop.2.2c/d/e/f)
- Setting T1 and T2 values to zero (DHCPInterop.2.1)

Possible Problem Summary

The following test cases have documented possible problems that allow for altered or omitted steps in their procedures. Please see each specific test case listed for more information:

- DHCPInterop.2.3: Transmission of Confirm Messages
- DHCPInterop.2.6: DNS Options

Group 1: DHCPv6 Messages

Scope

Tests in this group cover basic interoperability of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6).

Overview

These tests are designed to verify the readiness of DHCPv6 client, server and relay-agent interoperability the base specifications of the Dynamic Host Configuration Protocol for IPv6.

Test DHCPInterop.1.1: DHCPv6 Standard Exchange

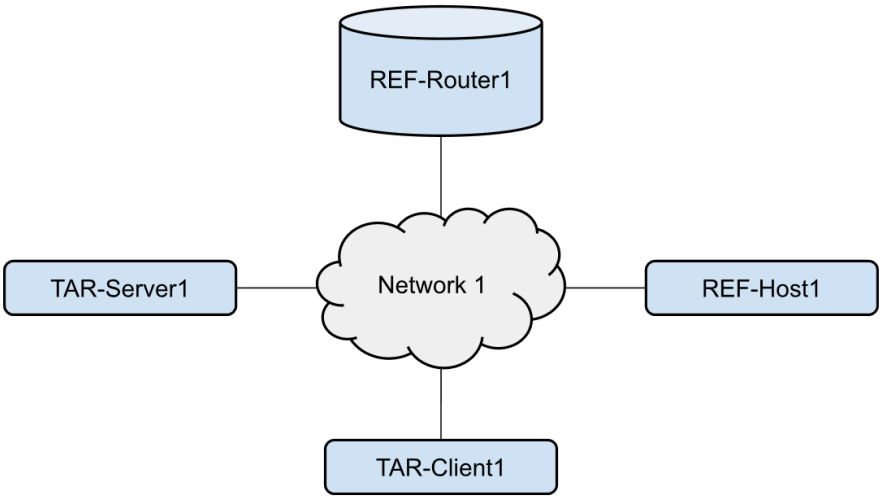
Purpose: To verify that a device can properly interoperate while initializing DHCPv6.

Reference:

- [DHCPv6] – Sections 5, 18.2, and 18.3
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 sends a Solicit message.
2.		TAR-Server1 sends an Advertise message with the IP address information included.
3.		TAR-Client1 then sends a Request message to confirm the IP address and ask for additional information.
4.		TAR-Server1 responds with a Reply message that contains the confirmed

		address. The Reply message will have either no status code or a status code of 0 (Success).
5.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part B: IA_PD

Step	Action	Expected Behavior
6.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6 Prefix Delegation.	TAR-Client1 sends a Solicit message.
7.		TAR-Server1 sends an Advertise message with the IA_PD included.
8.		TAR-Client1 then sends a Request message to confirm the prefix and ask for additional information.
9.		TAR-Server1 responds with a Reply message that contains the confirmed prefix.
10.	Wait for timer T1 to expire.	TAR-Client1 transmits a valid Renew message with the same prefix as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part C : Both IA_NA and IA_PD

Step	Action	Expected Behavior
11.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6 for both IA_NA and IA_PD.	TAR-Client1 sends a single Solicit message that contains both the IA_NA and IA_PD.
12.		TAR-Server1 sends a single Advertise message with the IA_NA and IA_PD included.
13.		TAR-Client1 then sends a single Request message to confirm the prefix and address.
14.		TAR-Server1 responds with a Reply message that contains the confirmed prefix and address.
15.	Wait for timer T1 to expire.	TAR-Client1 transmits a single valid Renew Message with the same prefix and address as given in the Reply Message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.2: Transmission of Renew Messages

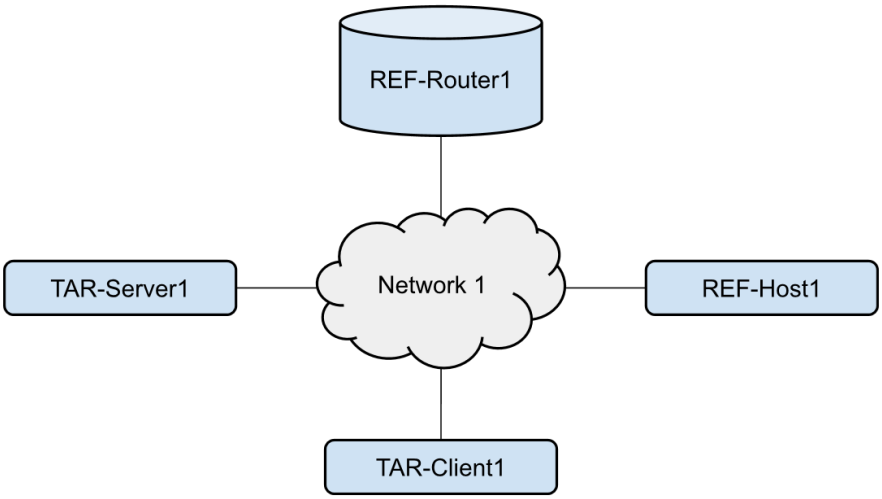
Purpose: To verify a client and server device properly handles Renew messages.

Reference:

- [DHCPv6] – Sections 18.2.4 and 18.3.4
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA (TAR-Server1 sets T1 to 50s and T2 to 80s).
2.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Server1 transmits a properly formatted

		Reply message in response to the Renew message.
3.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part B: IA_PD

Step	Action	Expected Behavior
4.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_PD (TAR-Server1 sets T1 to 50s and T2 to 80s).
5.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
6.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends a Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.

Part C: Both IA_NA and IA_PD

Step	Action	Expected Behavior
7.	Configure TAR-Client1 to enable DHCPv6 for both addresses and prefixes.	TAR-Client1 receives IPv6 address and prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA and IA_PD (TAR-Server1 sets T1 to 50s and T2 to 80s).
8.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a single Renew message containing both the IA_NA and IA_PD. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
9.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a single valid Renew Message with the same prefix and address as given in the Reply Message from the previous step.

Possible Problems: None.

Test DHCPInterop.1.3: Transmission of Rebind Messages

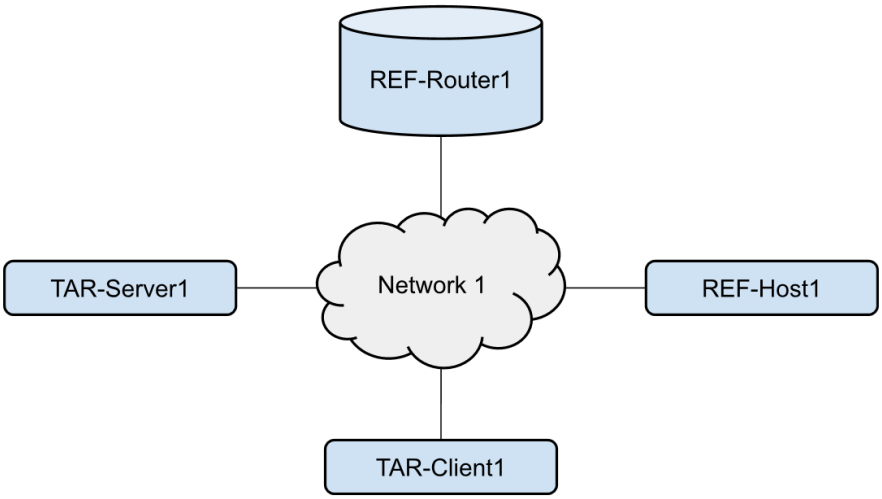
Purpose: To verify a client and server device properly handles Rebind messages.

Reference:

- [DHCPv6] – Sections 18.2.5 and 18.3.5
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA (TAR-Server1 sets T1 to 50s and T2 to 80s).
2.	Disconnect TAR-Server1 from Network 1.	
3.	Wait for timer T2 (80s) to expire.	After time T2 (80s) TAR-Client1 transmits a Rebind message.

4.	Reconnect TAR-Server1 to Network 1.	TAR-Client1 continues to transmit Rebind messages. TAR-Server1 transmits a Reply message with IA_NA and contains either no Status Code or a Status Code of 0 (success).
5.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part B: IA_PD

Step	Action	Expected Behavior
6.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_PD (TAR-Server1 sets T1 to 50s and T2 to 80s).
7.	Disconnect TAR-Server1 from Network 1.	
8.	Wait for timer T2 (80s) to expire.	After time T2 (80s) TAR-Client1 transmits a Rebind message.
9.	Reconnect TAR-Server1 to the link.	TAR-Client1 continues to transmit Rebind messages. TAR-Server1 transmits a Reply message with an IA_PD option and containing either no Status Code or a Status Code of 0 (success).
10.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a valid Renew message with the same prefix as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part C: Both IA_NA and IA_PD

Step	Action	Expected Behavior
11.	Configure TAR-Client1 to enable DHCPv6 for addresses and prefixes.	TAR-Client1 receives IPv6 address and prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA and IA_PD (TAR-Server1 sets T1 to 50s and T2 to 80s).
12.	Disconnect TAR-Server1 from Network 1.	
13.	Wait for timer T2 (80s) to expire.	After time T2 (80s) TAR-Client1 transmits a Rebind message with both the IA_PD and IA_NA options.
14.	Reconnect TAR-Server1 to Network 1.	TAR-Client1 continues to transmit Rebind messages. TAR-Server1 transmits a DHCPv6 Reply message with both IA_NA and IA_PD options and containing either

		no Status Code or a Status Code of 0 (success).
15.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a single valid Renew Message with the same prefix and address as given in the Reply Message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.4: Transmission of Decline Messages

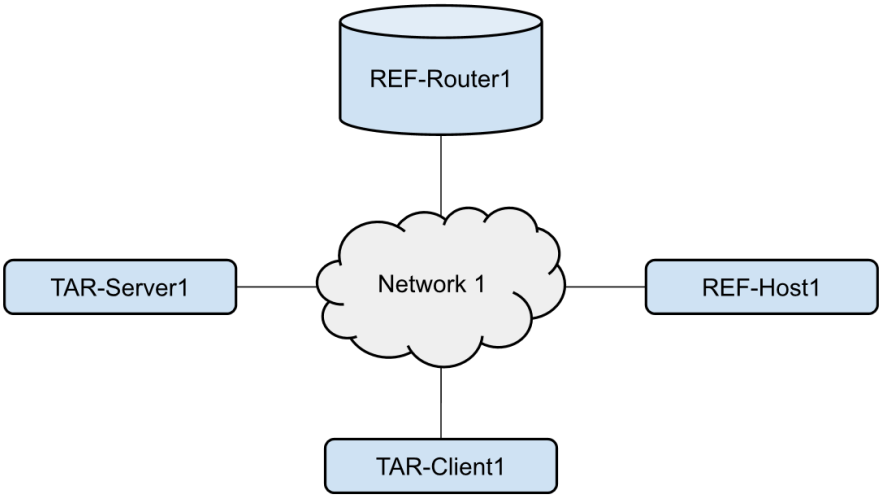
Purpose: Verify that a client and server properly handles the transmission and reception of Decline messages.

Reference:

- [DHCPv6] – Sections 18.2.8 and 18.3.8
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Step	Action	Expected Behavior
1.	Configure TAR-Server1 to have only the address of REF-Host1 in its address pool.	
2.	Configure TAR-Client1 to enable DHCPv6.	
3.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address. TAR-

		Client1 transmits a Decline message. TAR-Server1 transmits a Reply Message.
4.	TAR-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	TAR-Client1 must not reply to the Echo Request or Neighbor Solicitations from TAR-Server1.

Possible Problems: None.

Test DHCPInterop.1.5: Advertise Message Status

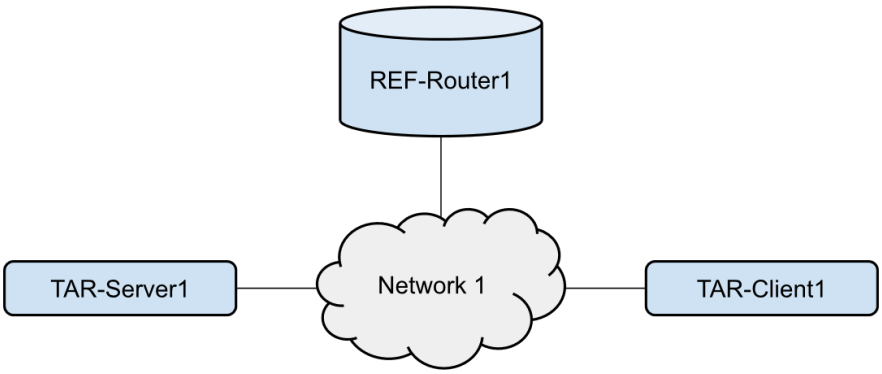
Purpose: To verify a client and server device properly handle Advertise messages with a status code of 2 (NoAddrsAvail) or status code of 6 (NoPrefixAvail).

Reference:

- [DHCPv6] – Sections 18.2.9, 18.3.9, and 21.13

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: NoAddrsAvail

Step	Action	Expected Behavior
1.	Configure TAR-Server1 to have no available addresses.	
2.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Server1 transmits an Advertise message containing a status code 2 (NoAddrsAvail). TAR-Client1 must ignore the Advertise message from TAR-Server1 and not transmit a Request message.

Part B: NoPrefixAvail

Step	Action	Expected Behavior

3.	Configure TAR-Server1 to have no available prefixes.	
4.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Server1 transmits an Advertise message containing a status code 6 (NoPrefixAvail). TAR-Client1 must ignore the Advertise message from TAR-Server1 and not transmit a Request message.

Possible Problems: None.

Test DHCPInterop.1.6: Transmission of Reply Message with NotOnLink

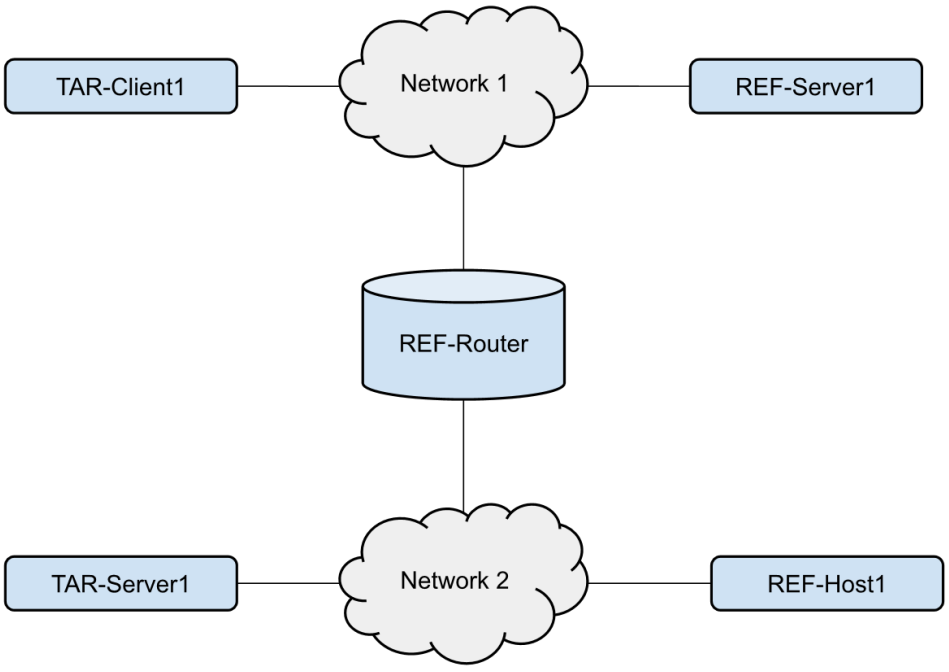
Purpose: To verify a client and server device properly handle Reply messages with NotOnLink.

Reference:

- [DHCPv6] – Sections 18.2.10 and 18.3.3
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1 and Network2. Disable DHCPv6 on all devices after test.



Procedure:

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6.	

2.	Allow enough time for TAR-Client1 to receive IPv6 address information from REF-Server1.	
3.	Disconnect TAR-Client1 from Network 1.	
4.	Allow enough time to elapse such that TAR-Client1 recognizes a link down; reconnect TAR-Client1 to Network 2.	TAR-Client1 transmits a properly formatted Confirm message. TAR-Server1 transmits a Reply message with a status code 4 (NotOnLink). TAR-Client1 transmits a Solicit message.
5.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	
6.	REF-Host1 transmits an ICMPv6 Echo Request to TAR-Client1's new global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Possible Problems: None.

Test DHCPInterop.1.7: Single Relay-Agent Exchange

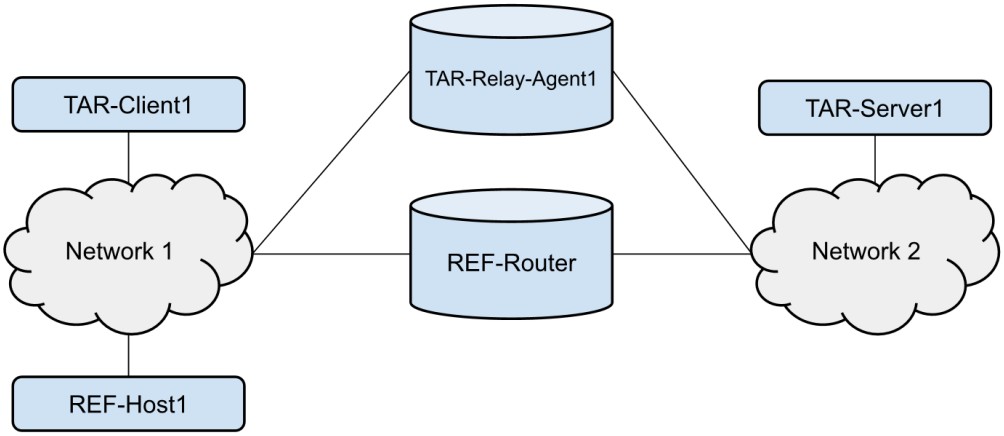
Purpose: To verify that a device can properly interoperate with a single DHCPv6 Relay-Agent.

Reference:

- [DHCPv6] – Sections 5, 18.2, 18.3, and 19
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1 and Network2. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Basic Message Exchange with Relay-Agent

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
2.	Wait remaining time until T1 has elapsed.	TAR-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply

		message will have either no status code or a status code of 0 (Success).

Part B: Confirm Message with Relay-Agent

Step	Action	Expected Behavior
3.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6 for IA_NA.	TAR-Client1 receives IPv6 address information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
4.	Disconnect TAR-Client1 from Network 1.	
5.	Allow enough time to elapse such that TAR-Client1 recognizes a link down, reconnect TAR-Client1 to Network 1.	TAR-Client1 transmits a properly formatted Confirm message. TAR-Relay-Agent1 relays the message to TAR-Server1.
6.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 relays the message to TAR-Client1.
7.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part C: Renew Message with Relay-Agent

Step	Action	Expected Behavior
8.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
9.	Wait for timer T1 (50s) to expire.	After time 50s (T1) TAR-Client1 transmits a Renew message. TAR-Relay-Agent1 relays the message to TAR-Server1.
10.		TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA(Address or Prefix). TAR-Relay-Agent1 relays the message to TAR-Client1.
11.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part D: Rebind Message with Relay-Agent

Step	Action	Expected Behavior
12.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.

13.	Disconnect TAR-Server1 from Network 2.	After time 80s (T2), TAR-Client1 transmits a Rebind message. TAR-Relay-Agent1 relays the message to TAR-Server1.
14.	Reconnect TAR-Server1 to Network 2.	TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA(Address or Prefix). TAR-Relay-Agent1 relays the message to TAR-Client1.
15.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part E: Release Message with Relay-Agent

Step	Action	Expected Behavior
16.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
17.	Configure TAR-Client1 to release the DHCPv6-acquired lease.	TAR-Client1 transmits a valid Release message. TAR-Relay-Agent1 relays the message to TAR-Server1.
18.		TAR-Server1 transmits a Relay-Reply message acknowledging the Release. TAR-Relay-Agent1 relays the message to TAR-Client1.
19.	Wait for timer T1 (50s) to expire.	TAR-Client1 does not transmit a Renew message with the addresses and prefixes as given in the Reply message from the previous step.

Part F: Decline Message with Relay-Agent

Step	Action	Expected Behavior
20.	Configure TAR-Server1 to have only the address of REF-Host1 in its address pool.	
21.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6.	TAR-Client1 receives the address of REF-Host1 in the Reply from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
22.		TAR-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address.
23.		TAR-Client1 transmits a Decline message. TAR-Relay-Agent1 relays the message to TAR-Server1.
24.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 relays the message to TAR-Client1.

25.	TAR-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	TAR-Client1 does not transmit an Echo Reply in response to the Echo Request from TAR-Server1.

Part G: Reconfigure Message with Relay-Agent

Step	Action	Expected Behavior
26.	Configure TAR-Client1 to disable auto-configuration and enable DHCPv6 and to enable transmitting the Reconfigure Accept option.	TAR-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 relaying the messages.
27.	Configure TAR-Server1 to transmit a Reconfigure message to TAR-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	TAR-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1 with TAR-Relay-Agent1 relaying the messages. TAR-Server1 transmits a Relay-Reply message.
28.	Wait remaining time until T1(50s) has elapsed.	TAR-Client1 transmits a valid Renew message with the same addresses ~~and~~ or prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.8: Layered Relay-Agents – Relay-Agent to Server Off-link

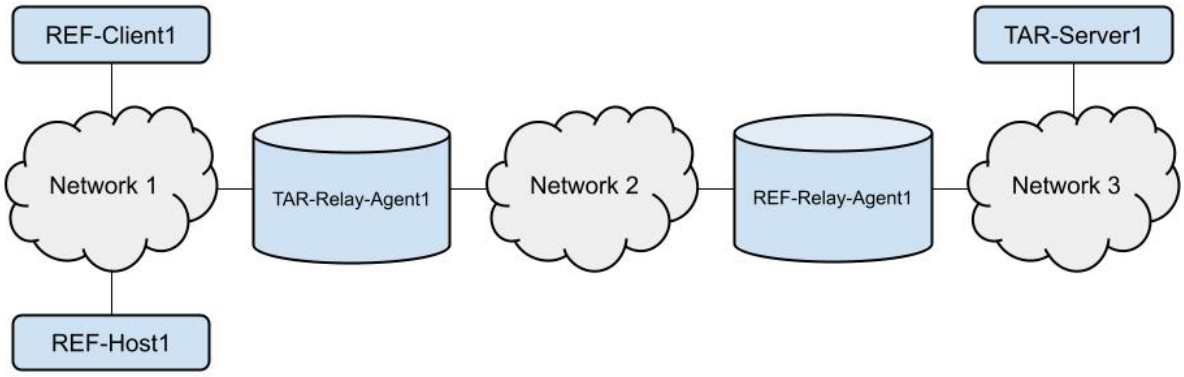
Purpose: To verify that a device can properly interoperate with multiple DHCPv6 Relay-Agents.

Reference:

- [DHCPv6] – Sections 5, 18.2, 18.3, and 19
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Basic Message Exchange with Layered Relay-Agents

Step	Action	Expected Behavior
1.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
2.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part B: Confirm Message with Layered Relay-Agents

Step	Action	Expected Behavior

3.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 for IA_NA.	REF-Client1 receives IPv6 address information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
4.	Disconnect REF-Client1 from Network 1.	
5.	Allow enough time to elapse such that REF -Client1 recognizes a link down, reconnect REF -Client1.	REF -Client1 transmits a properly formatted Confirm message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
6.		TAR-Server1 transmits a Relay-Reply message with no IA options. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
7.	REF-Host1 transmits an Echo Request to REF-Client1's global address.	REF-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part C: Renew Message with Layered Relay-Agents

Step	Action	Expected Behavior
8.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
9.	Wait for timer T1 (50s) to expire.	After time 50s (T1) REF-Client1 transmits a Renew message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
10.		TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
11.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part D: Rebind Message with Layered Relay-Agents

Step	Action	Expected Behavior
12.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
13.	Disconnect TAR-Server1 from Network 3.	After time 80s (T2), REF-Client1 transmits a Rebind message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.

14.	Reconnect TAR-Server1 to Network 3.	TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
15.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part E: Release Message with Layered Relay-Agents

Step	Action	Expected Behavior
16.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
17.	Configure REF-Client1 to release the DHCPv6-acquired lease.	REF-Client1 transmits a valid Release message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
18.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
19.	Wait for timer T1 (50s) to expire.	REF-Client1 does not transmit a Renew message with the addresses and prefixes as given in the Reply message from the previous step.

Part F: Decline Message with Layered Relay-Agents

Step	Action	Expected Behavior
20.	Configure TAR-Server1 to have only the address of REF-Host1 in its address pool.	
21.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives the address of REF-Host1 in the Reply from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
22.		REF-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address.
23.		REF-Client1 transmits a Decline message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
24.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and REF-

		Relay-Agent1 relay the message to REF-Client1.
25.	TAR-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	REF-Client1 does not transmit an Echo Reply in response to the Echo Request from TAR-Server1.

Part G: Reconfigure Message with Layered Relay-Agents

Step	Action	Expected Behavior
29.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 and to enable transmitting the Reconfigure Accept option.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
30.	Configure TAR-Server1 to transmit a Reconfigure message to REF-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	REF-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages. TAR-Server1 transmits a Relay-Reply message.
31.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.9: Layered Relay-Agents – Relay-Agent to Server On-link

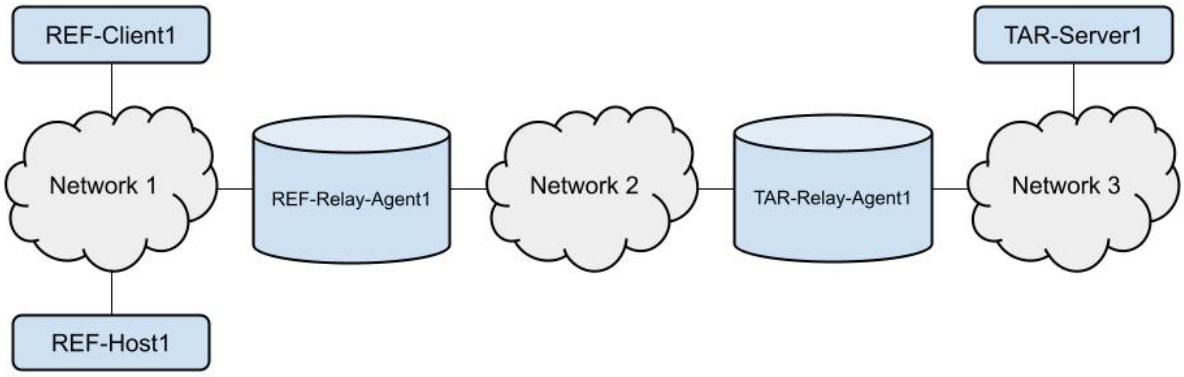
Purpose: To verify that a device can properly interoperate with multiple DHCPv6 Relay-Agents.

Reference:

- [DHCPv6] – Sections 5, 18.2, 18.3, and 19
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Basic Message Exchange with Layered Relay-Agents

Step	Action	Expected Behavior
1.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
2.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part B: Confirm Message with Layered Relay-Agents

Step	Action	Expected Behavior

3.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 for IA_NA.	REF-Client1 receives IPv6 address information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
4.	Disconnect REF-Client1 from Network 1.	
5.	Allow enough time to elapse such that REF-Client1 recognizes a link down, reconnect REF -Client1.	REF-Client1 transmits a properly formatted Confirm message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
6.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
7.	REF-Host1 transmits an Echo Request to REF-Client1's global address.	REF-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part C: Renew Message with Layered Relay-Agents

Step	Action	Expected Behavior
8.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
9.	Wait for timer T1 (50s) to expire.	After time 50s (T1) REF-Client1 transmits a Renew message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
10.		TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
11.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part D: Rebind Message with Layered Relay-Agents

Step	Action	Expected Behavior
12.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
13.	Disconnect TAR-Server1 from Network 3.	After time 80s (T2), REF-Client1 transmits a Rebind message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.

14.	Reconnect TAR-Server1 to Network 3.	TAR-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
15.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part E: Release Message with Layered Relay-Agents

Step	Action	Expected Behavior
16.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
17.	Configure REF-Client1 to release the DHCPv6-acquired lease.	REF-Client1 transmits a valid Release message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
18.		TAR-Server1 transmits a Relay-Reply message.TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to REF-Client1.
19.	Wait for timer T1 (50s) to expire.	REF-Client1 does not transmit a Renew message with the addresses and prefixes as given in the Reply message from the previous step.

Part F: Decline Message with Layered Relay-Agents

Step	Action	Expected Behavior
20.	Configure TAR-Server1 to have only the address of REF-Host1 in its address pool.	
21.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives the address of REF-Host1 in the Reply from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
22.		REF-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address.
23.		REF-Client1 transmits a Decline message. TAR-Relay-Agent1 and REF-Relay-Agent1 relay the message to TAR-Server1.
24.		TAR-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and REF-

		Relay-Agent1 relay the message to REF-Client1.
25.	TAR-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	REF-Client1 does not transmit an Echo Reply in response to the Echo Request from TAR-Server1.

Part G: Reconfigure Message with Layered Relay-Agents

Step	Action	Expected Behavior
32.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 and to enable transmitting the Reconfigure Accept option.	REF-Client1 receives IPv6 address or prefix information from TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages.
33.	Configure TAR-Server1 to transmit a Reconfigure message to REF-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	REF-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1 with TAR-Relay-Agent1 and REF-Relay-Agent1 relaying the messages. TAR-Server1 transmits a Relay-Reply message.
34.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.10: Layered Relay-Agents – Relay-Agent to Relay-Agent, Server Off-link

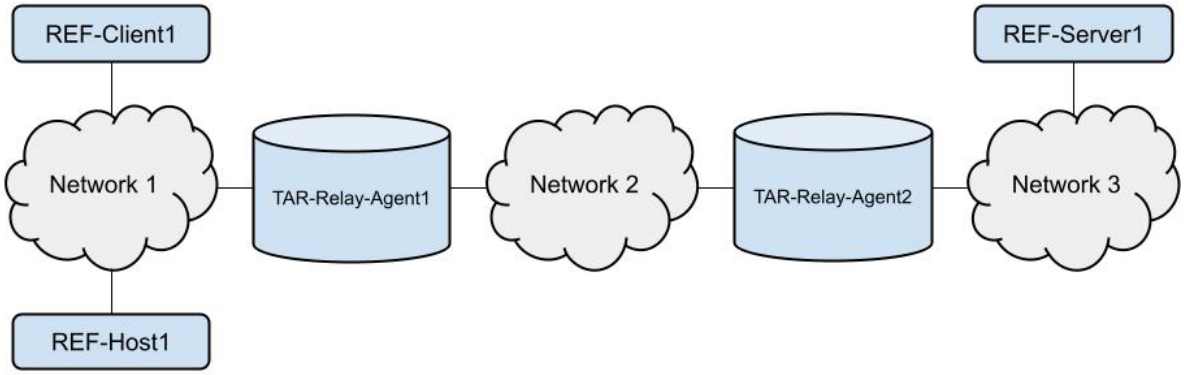
Purpose: To verify that a device can properly interoperate with multiple DHCPv6 Relay-Agent.

Reference:

- [DHCPv6] – Sections 5, 18.2, 18.3, and 19
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Basic Message Exchange with Layered Relay-Agents

Step	Action	Expected Behavior
1.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
2.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part B: Confirm Message with Layered Relay-Agents

Step	Action	Expected Behavior
3.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 for IA_NA.	REF-Client1 receives IPv6 address information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
4.	Disconnect REF-Client1 from Network 1.	
5.	Allow enough time to elapse such that REF-Client1 recognizes a link down, reconnect REF-Client1.	REF-Client1 transmits a properly formatted Confirm message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
6.		REF-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
7.	REF-Host1 transmits an Echo Request to REF-Client1's global address.	REF-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part C: Renew Message with Layered Relay-Agents

Step	Action	Expected Behavior
8.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
9.	Wait for timer T1 (50s) to expire.	After time 50s (T1) REF-Client1 transmits a Renew message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
10.		REF-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
11.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part D: Rebind Message with Layered Relay-Agents

Step	Action	Expected Behavior
12.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with

		TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
13.	Disconnect REF-Server1 from Network 3.	After time 80s (T2), REF-Client1 transmits a Rebind message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
14.	Reconnect REF-Server1 to Network 3.	REF-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
15.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part E: Release Message with Layered Relay-Agents

Step	Action	Expected Behavior
16.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
17.	Configure REF-Client1 to release the DHCPv6-acquired lease.	REF-Client1 transmits a valid Release message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
18.		REF-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
19.	Wait for timer T1 (50s) to expire.	REF-Client1 does not transmit a Renew message with the addresses and prefixes as given in the Reply message from the previous step.

Part F: Decline Message with Layered Relay-Agents

Step	Action	Expected Behavior
20.	Configure REF-Server1 to have only the address of REF-Host1 in its address pool.	
21.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives the address of REF-Host1 in the Reply from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
22.		REF-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address.

23.		REF-Client1 transmits a Decline message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
24.		REF-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
25.	REF-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	REF-Client1 does not transmit an Echo Reply in response to the Echo Request from REF-Server1.

Part G: Reconfigure Message with Layered Relay-Agents

Step	Action	Expected Behavior
35.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 and to enable transmitting the Reconfigure Accept option.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
36.	Configure REF-Server1 to transmit a Reconfigure message to REF-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	REF-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages. REF-Server1 transmits a Relay-Reply message.
37.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.11: Layered Relay-Agents – Relay-Agent to Relay-Agent, Server On-link

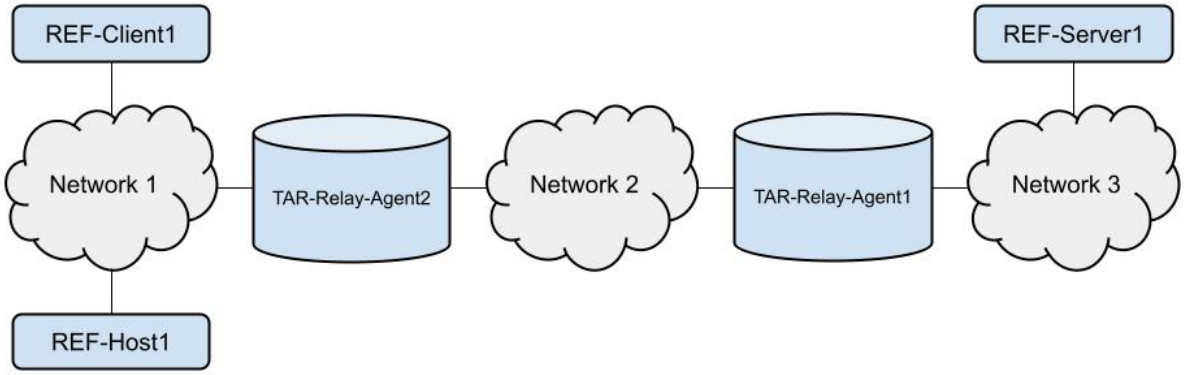
Purpose: To verify that a device can properly interoperate with multiple DHCPv6 Relay-Agent.

Reference:

- [DHCPv6] – Sections 5, 18.2, 18.3, and 19
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize REF-Server1 and enable DHCPv6. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Basic Message Exchange with Layered Relay-Agents

Step	Action	Expected Behavior
1.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
2.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part B: Confirm Message with Layered Relay-Agents

Step	Action	Expected Behavior
3.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 for IA_NA.	REF-Client1 receives IPv6 address information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
4.	Disconnect REF-Client1 from Network 1.	
5.	Allow enough time to elapse such that REF-Client1 recognizes a link down, reconnect REF-Client1.	REF-Client1 transmits a properly formatted Confirm message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
6.		REF-Server1 transmits a Relay-Reply message.TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
7.	REF-Host1 transmits an Echo Request to REF-Client1's global address.	REF-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part C: Renew Message with Layered Relay-Agents

Step	Action	Expected Behavior
8.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
9.	Wait for timer T1 (50s) to expire.	After time 50s (T1) REF-Client1 transmits a Renew message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
10.		REF-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
11.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part D: Rebind Message with Layered Relay-Agents

Step	Action	Expected Behavior
12.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with

		TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
13.	Disconnect REF-Server1 from Network 3.	After time 80s (T2), REF-Client1 transmits a Rebind message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
14.	Reconnect REF-Server1 to Network 3.	REF-Server1 transmits a Relay-Reply message that contains the confirmed IA. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
15.	Wait for timer T1 (50s) to expire.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part E: Release Message with Layered Relay-Agents

Step	Action	Expected Behavior
16.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
17.	Configure REF-Client1 to release the DHCPv6-acquired lease.	REF-Client1 transmits a valid Release message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
18.		REF-Server1 transmits a Relay-Reply message.TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
19.	Wait for timer T1 (50s) to expire.	REF-Client1 does not transmit a Renew message with the addresses and prefixes as given in the Reply message from the previous step.

Part F: Decline Message with Layered Relay-Agents

Step	Action	Expected Behavior
20.	Configure REF-Server1 to have only the address of REF-Host1 in its address pool.	
21.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6.	REF-Client1 receives the address of REF-Host1 in the Reply from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
22.		REF-Client1 transmits a DAD NS for its global address. REF-Host1 transmits a DAD NA in response to the DAD NS with non-unique tentative address.

23.		REF-Client1 transmits a Decline message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Server1.
24.		REF-Server1 transmits a Relay-Reply message. TAR-Relay-Agent1 and TAR-Relay-Agent2 relay the message to REF-Client1.
25.	REF-Server1 transmits an ICMPv6 Echo Request to REF-Host1's global address.	REF-Client1 does not transmit an Echo Reply in response to the Echo Request from REF-Server1.

Part G: Reconfigure Message with Layered Relay-Agents

Step	Action	Expected Behavior
38.	Configure REF-Client1 to disable auto-configuration and enable DHCPv6 and to enable transmitting the Reconfigure Accept option.	REF-Client1 receives IPv6 address or prefix information from REF-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages.
39.	Configure REF-Server1 to transmit a Reconfigure message to REF-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	REF-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1 with TAR-Relay-Agent1 and TAR-Relay-Agent2 relaying the messages. REF-Server1 transmits a Relay-Reply message.
40.	Wait remaining time until T1 has elapsed.	REF-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.12: Rebind Reply From Another Server

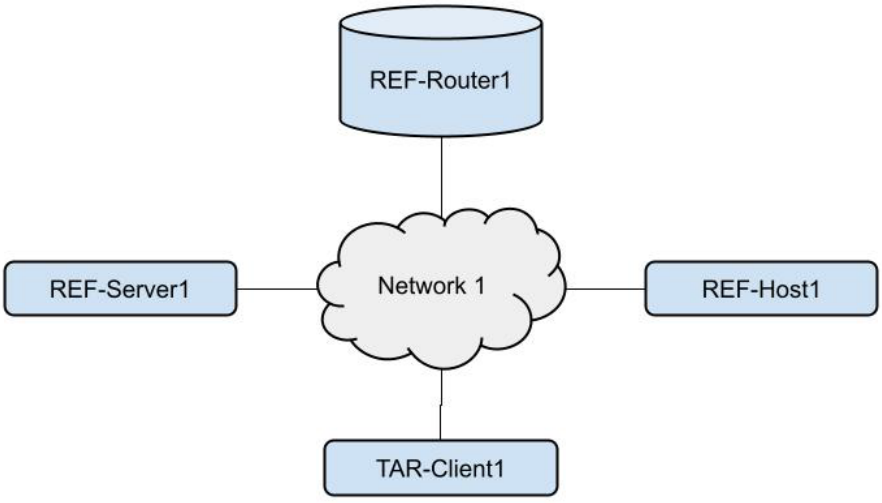
Purpose: To verify that a client correctly rebinds to a different server.

Reference:

- [DHCPv6] – Sections 18.2.5 and 18.3.5

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A – IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for IA_NA.	TAR-Client1 receives IPv6 address information from REF-Server1. REF-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA (REF-Server1 sets T1 to 50s and T2 to 80s).
2.	Disconnect REF-Server1 from Network 1.	
3.	Wait for timer T2 (80s) to expire.	After time T2 (80s) TAR-Client1 transmits a Rebind message.

4.	Connect TAR-Server1 to Network1 and enable DHCPv6.	TAR-Server1 has three options to respond to the rebind message: • TAR-Server1 responds with new bindings only • TAR Server1 responds with an IA option with a status code of NoAddrAvail • TAR Server1 responds with an IA option with a status code of NoBinding
5.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	
6.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part B – IA_PD

Step	Action	Expected Behavior
7.	Configure TAR-Client1 to enable DHCPv6 for IA_PD.	TAR-Client1 receives IPv6 prefix information from REF-Server1. REF-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_PD (REF-Server1 set T1 to 50s and T2 to 80s).
8.	Disconnect REF-Server1 from Network 1.	
9.	Wait for timer T2 (80s) to expire.	After time T2 (80s) TAR-Client1 transmits a Rebind message.
10.	Connect TAR-Server1 to Network 1 and enable DHCPv6.	TAR-Server1 has three options to respond to the Rebind message: • TAR-Server1 responds with new bindings only • TAR Server1 responds with an IA option with a status code of NoPrefixAvail • TAR Server1 responds with an IA option with a status code of NoBinding
11.	Allow enough time for TAR-Client1 to receive IPv6 prefix information from TAR-Server1.	
12.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a valid Renew message with the same prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Part C – Both IA_NA and IA_PD

Step	Action	Expected Behavior
13.	Configure TAR-Client1 to enable DHCPv6 for IA_NA and IA_PD.	TAR-Client1 receives IPv6 address and prefix information from REF-Server1. REF-Server1 assigns T1 and T2 parameters to TAR-Client1's IAs (T1=50s and T2=80s).
14.	Disconnect REF-Server1 from Network 1.	
15.	Wait for timer T2 (80s) to expire.	After time T2(80s) TAR-Client1 transmits a Rebind message.
16.	Connect TAR-Server1 to Network 1 and enable DHCPv6.	TAR-Server1 has three options to respond to the Rebind message: • TAR-Server1 responds with new bindings only • TAR Server1 responds with an IA option with a status code of NoPrefixAvail • TAR Server1 responds with an IA option with a status code of NoBinding
17.	Allow enough time for TAR-Client1 to receive IPv6 address and prefix information from TAR-Server1.	
18.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a valid Renew message with the same addresses and prefixes as given in the Reply message from the previous step. The Reply message will have either no status code or a status code of 0 (Success).

Possible Problems: None.

Test DHCPInterop.1.13: Address Lifetime

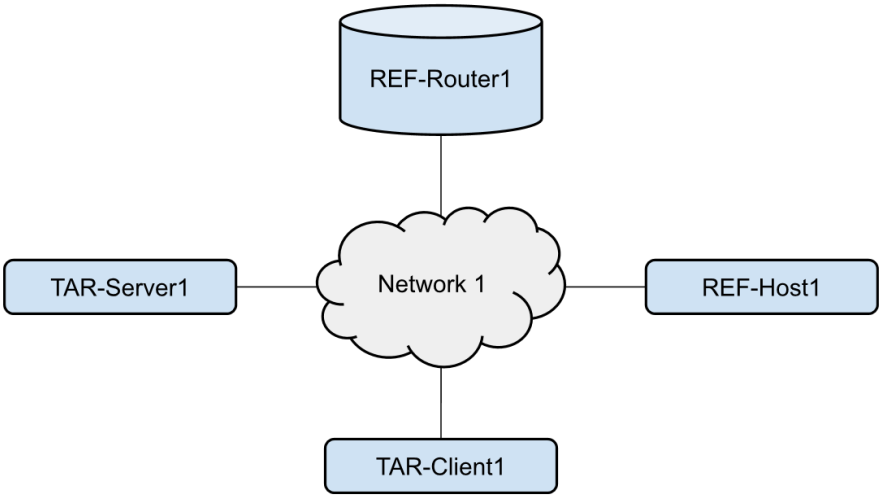
Purpose: To verify that a client properly processes lifetime values from a server.

Reference:

- [DHCPv6] – Section 18.2.10.1
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Server1 to assign addresses with valid lifetimes of 60 seconds.	
2.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns the address a valid lifetime of 60 seconds in the Reply message.
3.	Disconnect TAR-Server1 from Network1.	

4.	Wait 65 seconds.	
5.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 must not transmit an Echo Reply in response to the Echo Request from REF-Host1.
6.	Wait remaining time until T2.	TAR-Client1 must not transmit any Renew or Rebind messages containing the IA_NA advertised in Step 2.

Part B: IA_PD

Step	Action	Expected Behavior
7.	Configure TAR-Server1 to assign prefixes with a valid lifetime of 60 seconds.	
8.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns the prefix a valid lifetime of 60 seconds in the Reply message.
9.	Disconnect TAR-Server1 from Network1.	
10.	Wait 65 seconds.	
11.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 must not transmit an Echo Reply in response to the Echo Request from REF-Host1.
12.	Wait T2 seconds.	TAR-Client1 must not transmit any Renew or Rebind messages containing the IA_PD advertised in Step 8.

Possible Problems: None.

Test DHCPInterop.1.14: Refreshing Configuration Information

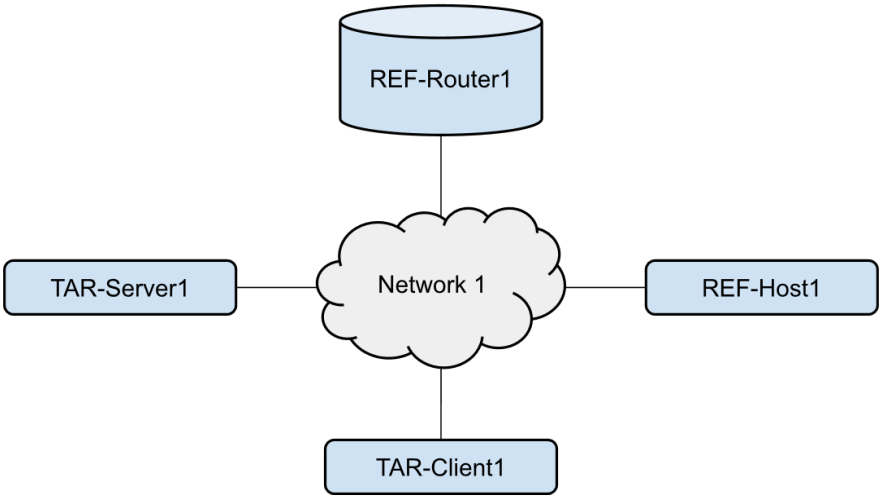
Purpose: To verify that a client with both IA_NA and IA_PD leases properly transmits Rebind messages to refresh configuration information.

Reference:

- [DHCPv6] – Section 18.2.12

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Reboot

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for both addresses and prefixes.	TAR-Client1 receives IPv6 address and prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA's (TAR-Server1 sets T1 to 50s and T2 to 80s).
2.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a Renew message

		containing both the IA_NA and IA_PD. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
3.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.
4.	Reboot TAR-Client1.	After TAR-Client1 completes the reboot, it transmits a DHCPv6 Rebind message containing both the IA_NA and IA_PD. TAR-Client1 must not transmit a Confirm message. TAR-Server1 transmits a valid Reply message with no status code or a status code of 0 (success).
5.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends a Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a Renew message containing both the IA_NA and IA_PD. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.

Part B: Reconnect

Step	Action	Expected Behavior
6.	Configure TAR-Client1 to enable DHCPv6 for both addresses and prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA's (TAR-Server1 sets T1 to 50s and T2 to 80s).
7.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a Renew message containing both an IA_NA and IA_PD. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
8.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.
9.	Disconnect TAR-Client1 from Network1.	~~After TAR-Client1 completes the reboot, it transmits a DHCPv6 Rebind message containing both the IA_NA and IA_PD. TAR-Client1 must not transmit a Confirm message. TAR-Server1 transmits a valid Reply message.~~
10.	Connect TAR-Client1 to Network1.	After TAR-Client1 reconnects to Network1 it transmits a DHCPv6 Rebind message containing both the IA_NA and IA_PD. TAR-Client1 must not transmit a Confirm message.-TAR-Server1 transmits a valid

		Reply message with no status code or a status code of 0 (success).
11.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends a Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a Renew message containing both the IA_NA and IA_PD. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.

Possible Problems: None.

Group 2: Configured Exchanges

Scope

Tests in this group cover interoperability of the Dynamic Host Configuration Protocol for parameters set by the server for the client.

Overview

These tests are designed to verify that the server can send DHCPv6 parameters to the client and they are honored.

Test DHCPInterop.2.1: T1/T2 Time of Zero

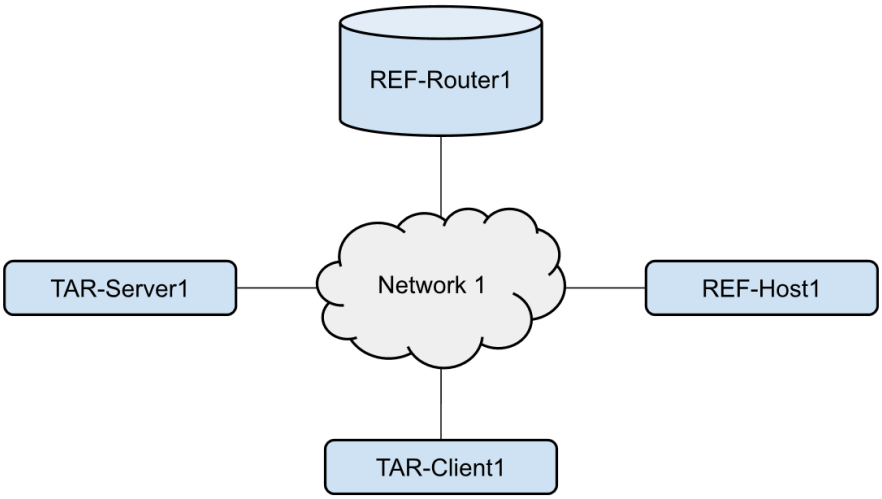
Purpose: To verify that a client properly processes the T1/T2 timers set to zero.

Reference:

- [DHCPv6] – Section 14.2, 18.2.10

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: T1 of Zero in IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Server1 to advertise a T1 value of 0 in IA_NA.	
2.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns the T1 value of 0 to TAR-Client1's IA_NA.
3.		TAR-Client1 must not transmit a DHCPv6 Renew message immediately.

Part B: T2 of Zero in IA_NA

Step	Action	Expected Behavior
4.	Configure TAR-Server1 to advertise a T1 and T2 value of 0 in IA_NA.	
5.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns the T1 and T2 value of 0 to TAR-Client1's IA_NA.
6.	Disconnect TAR-Server1 from Network 1.	TAR-Client1 must not transmit a DHCPv6 Rebind message immediately after the Renew or Reply message.

Part C: T1 of Zero in IA_PD

Step	Action	Expected Behavior
7.	Configure TAR-Server1 to advertise a T1 value of 0 in IA_PD.	
8.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns the T1 value of 0 to TAR-Client1's IA_PD.
9.		TAR-Client1 must not transmit a DHCPv6 Renew message immediately.

Part D: T2 of Zero in IA_PD

Step	Action	Expected Behavior
10.	Configure TAR-Server1 to advertise a T1 and T2 value of 0 in IA_PD.	
11.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns T1 and T2 values of 0 to TAR-Client1's IA_NA.
12.	Disconnect TAR-Server1 from Network 1.	TAR-Client1 must not transmit a DHCPv6 Rebind message immediately after the Renew or Reply message.

Possible Problems: None.

Test DHCPInterop.2.2: Change Address and Prefixes

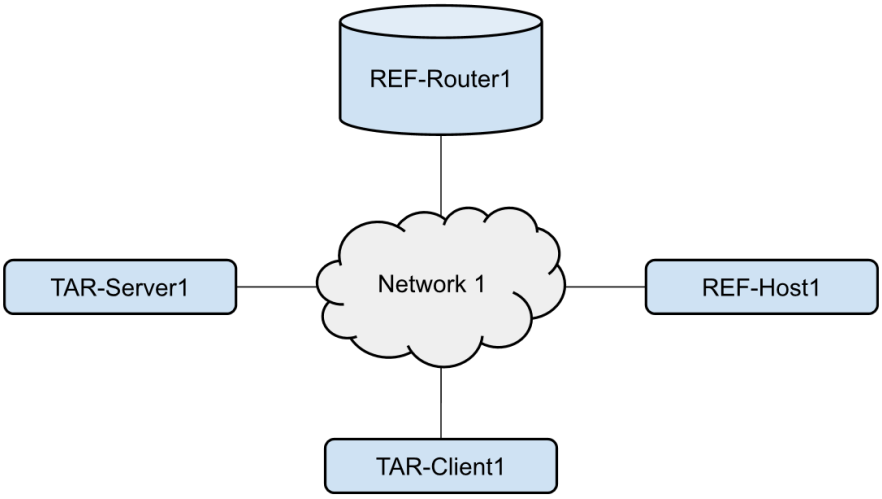
Purpose: To verify that a client properly updates address and prefixes lifetime values from the server.

Reference:

- [DHCPv6] – Section 18.2.10
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: Change Address

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for addresses.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 assigns T1 and T2 parameters to TAR-Client1's IA_NA (TAR-Server1 sets T1 to 50s and T2 to 80s).
2.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the

		Reply message from TAR-Server1. ~~TAR-Client1 transmits a Renew message.~~ TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
3.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 1.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.
4.	Configure TAR-Server1 to remove the current address of TAR-Client1 from the address pool and leases.	
5.	Wait for a Renew message from TAR-Client1.	TAR-Client1 transmits a Renew message. TAR-Server1 transmits a Reply message with an IA_NA with a new address.
6.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 1.	TAR-Client1 must NOT transmit an Echo Reply in response to the Echo Request from REF-Host1.
7.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 5.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part B: Change Prefix

Step	Action	Expected Behavior
8.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 assigns the T1 and T2 parameters to TAR-Client1's IA_PD (TAR-Server1 sets T1 to 50s and T2 to 80s).
9.	Wait for timer T1 (50s) to expire.	TAR-Client1 sends its first Renew message T1 (50) seconds after the reception of the Reply message from TAR-Server1. TAR-Client1 transmits a Renew message with the IA_PD from Step 8. TAR-Server1 transmits a properly formatted Reply message in response to the Renew message.
10.	Configure TAR-Server1 to remove the current prefix of TAR-Client1 from the prefix pool.	
11.	Wait for a Renew message from TAR-Client1.	TAR-Client1 transmits a Renew message. TAR-Server1 transmits a Reply message with an IA_PD with a new prefix.
12.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a Renew message with the new prefix. TAR-Server1 transmits a Reply message.

Part C: Change Address from Reconfigure-Renew

Step	Action	Expected Behavior

13.	Configure TAR-Client1 to enable DHCPv6 for addresses and to enable transmitting the Reconfigure Accept option.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 includes an Authentication Option with its fields set for RKAP in the Reply message.
14.	Configure TAR-Server1 to remove the current address of TAR-Client1 from the address pool.	
15.	Configure TAR-Server1 to transmit a Reconfigure message to TAR-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	TAR-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1. TAR-Server1 transmits a Reply message with an IA_NA with a new address.
16.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 13.	TAR-Client1 must NOT transmit an Echo Reply in response to the Echo Request from REF-Host1.
17.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 15.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part D: Change Prefix from Reconfigure-Renew

Step	Action	Expected Behavior
18.	Configure TAR-Client1 to enable DHCPv6 for prefixes and to enable transmitting the Reconfigure Accept option.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 includes an Authentication Option with its fields set for RKAP in the Reply message.
19.	Configure TAR-Server1 to remove the current prefix of TAR-Client1 from the prefix pool.	
20.	Configure TAR-Server1 to transmit a Reconfigure message to TAR-Client1 with a Reconfigure Message option with msg-type 5 (Renew).	TAR-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1. TAR-Server1 transmits a Reply message with an IA_PD with a new prefix. TAR-Server1 sets T1 to 50s and T2 to 80s
21.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a Renew message with the new prefix. TAR-Server1 transmits a Reply message.

Part E: Change Address from Reconfigure-Rebind

Step	Action	Expected Behavior
22.	Configure TAR-Client1 to enable DHCPv6 for addresses and to enable transmitting the Reconfigure Accept option.	TAR-Client1 receives IPv6 address information from TAR-Server1. TAR-Server1 includes an Authentication Option with its fields set for RKAP in the Reply message.

23.	Configure TAR-Server1 to remove the current address of TAR-Client1 from the address pool.	
24.	Configure TAR-Server1 to transmit a Reconfigure message to TAR-Client1 with a Reconfigure Message option with msg-type 6 (Rebind).	TAR-Client1 successfully authenticates the Reconfigure message and transmits a Rebind message to TAR-Server1. TAR-Client1 receives new IPv6 address information from TAR-Server1.
25.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 24.	TAR-Client1 must NOT transmit an Echo Reply in response to the Echo Request from REF-Host1.
26.	REF-Host1 transmits an Echo Request to TAR-Client1's global address in Step 27.	TAR-Client1 transmits an Echo Reply in response to the Echo Request from REF-Host1.

Part F: Change Prefix from Reconfigure-Rebind

Step	Action	Expected Behavior
27.	Configure TAR-Client1 to enable DHCPv6 for prefixes and to enable transmitting the Reconfigure Accept option.	TAR-Client1 receives IPv6 prefix information from TAR-Server1. TAR-Server1 includes an Authentication Option with its fields set for RKAP in the Reply message.
28.	Configure TAR-Server1 to remove the current prefix of TAR-Client1 from the prefix pool.	
29.	Configure TAR-Server1 to transmit a Reconfigure message to TAR-Client1 with a Reconfigure Message option with msg-type 6 (Rebind).	TAR-Client1 successfully authenticates the Reconfigure message and transmits a Renew message to TAR-Server1. TAR-Client1 receives new IPv6 prefix information from TAR-Server1. TAR-Server1 sets T1 to 50s and T2 to 80s
30.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a Renew message with the new prefix. TAR-Server1 transmits a Reply message.

Possible Problems: None.

Test DHCPInterop.2.3: Transmission of Confirm Messages

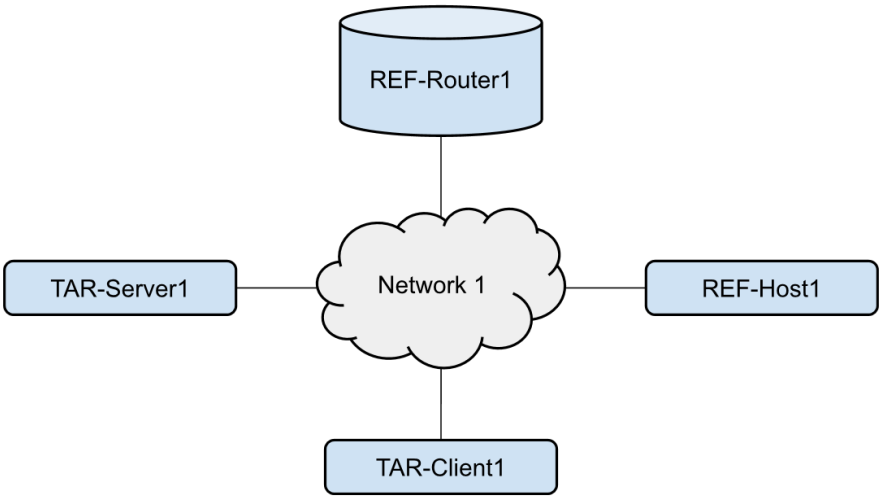
Purpose: To verify a client and server device properly handles Confirm messages.

Reference:

- [DHCPv6] – Section 18.2.3
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6.	
2.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	
3.	Disconnect TAR-Client1 from Network 1.	
4.	Allow enough time to elapse such that TAR-Client1 recognizes a link down, reconnect TAR-Client1 to Network1.	TAR-Client1 transmits a Confirm message to the server. TAR-Server1 responds with a Reply without a status code option or with a status code option including a status code of 0 (Success) stating that the addresses are appropriate for the link.

		The Reply Message must not contain an IA Option.
5.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 sends an Echo Reply in response to the Echo Request from REF-Host1.

Possible Problems: According to Section 18.2.12 of RFC 8415, if the client has an IA_PD and IA_NA it must send Rebind message when detecting a link event. If a client does this behavior they may omit this test case.

Test DHCPInterop.2.4: Transmission of Release Messages

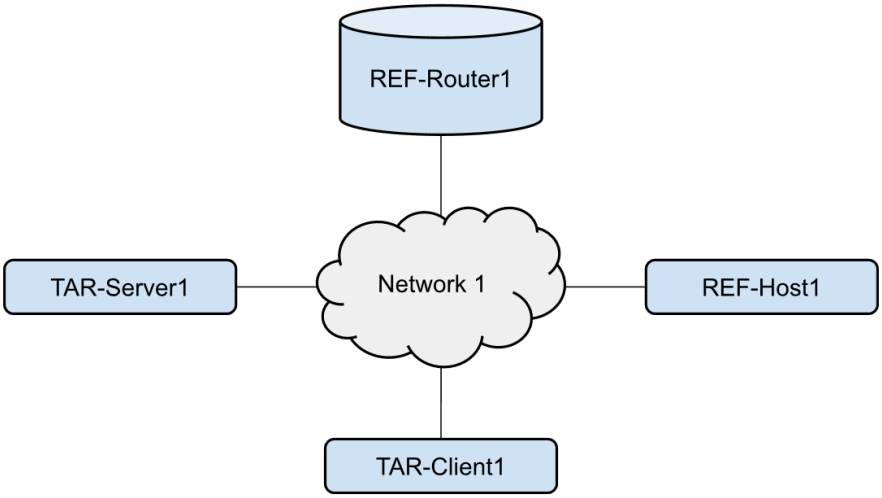
Purpose: To verify that a client and server device transmits properly formatted Release messages and to verify that a client device properly releases IPv6 addresses and/or delegated prefixes configured by a server.

Reference:

- [DHCPv6] – Sections 18.2.7
- [ICMPv6] – Section 5.5.3

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to enable DHCPv6 for addresses	
2.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	
3.	Configure TAR-Client1 to release the IPv6 global address.	TAR-Client1 transmits a Release message. TAR-Server1 transmits a Reply message in response with a success code.

4.	REF-Host1 transmits an ICMPv6 Echo Request to TAR-Client1's released address.	TAR-Client1 must not reply to the Echo Request or Neighbor Solicitations from REF-Host1.
5.	Wait for timer T1 (50s) to expire.	TAR-Client1 must not transmit a Renew message for the address in Step 3.

Part B: IA_PD

Step	Action	Expected Behavior
6.	Configure TAR-Client1 to enable DHCPv6 for prefixes.	
7.	Allow enough time for TAR-Client1 to receive IPv6 prefix information from TAR-Server1.	
8.	Configure TAR-Client1 to release the IPv6 prefix.	TAR-Client1 transmits a Release message. TAR-Server1 transmits a Reply message in response with a success code.
9.	Wait for timer T1 (50s) to expire.	TAR-Client1 must not transmit a Renew message for the prefix advertised in step 8.

Part C: Both IA_NA and IA_PD

Step	Action	Expected Behavior
10.	Configure TAR-Client1 to enable DHCPv6 for addresses and prefixes.	
11.	Allow enough time for TAR-Client1 to receive IPv6 address and prefix information from TAR-Server1.	
12.	Configure TAR-Client1 to release the IPv6 address and prefix.	TAR-Client1 transmits a Release message containing both IA_NA and IA_PD. TAR-Server1 transmits a Reply message in response with a success code.
13.	REF-Host1 transmits an ICMPv6 Echo Request to TAR-Client1's released address.	TAR-Client1 must not reply to the Echo Request or Neighbor Solicitations from REF-Host1.
14.	Wait for timer T1 (50s) to expire.	TAR-Client1 must not transmit a Renew message for the prefix advertised in step 12.

Possible Problems: None.

Test DHCPInterop.2.5: Rapid Commit

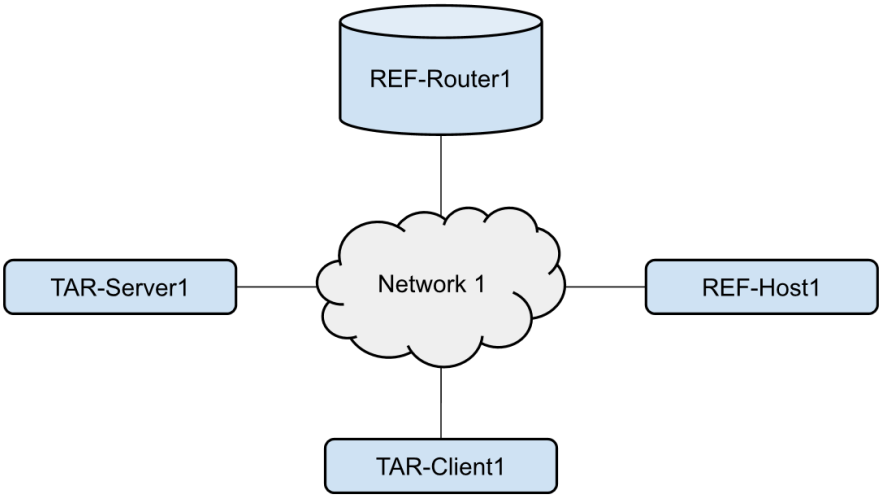
Purpose: To verify a client and server correctly process a two-message Rapid Commit exchange.

Reference:

- [DHCPv6] – Sections 18.2.10.1, 21.14

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A: IA_NA

Step	Action	Expected Behavior
1.	Configure TAR-Client1 to disable auto configuration and enable DHCPv6 with Rapid Commit.	TAR-Client1 sends a Solicit message with a Rapid Commit option.
2.		TAR-Server1 transmits a Reply message containing IPv6 address information and a Rapid Commit option.
3.	REF-Host1 transmits an Echo Request to TAR-Client1's global address.	TAR-Client1 sends an Echo Reply in response to the Echo Request from REF-Host1.

Part B: IA_PD

Step	Action	Expected Behavior
4.	Configure TAR-Client1 to disable auto configuration and enable DHCPv6 with Rapid Commit.	TAR-Client1 sends a Solicit message with a Rapid Commit option.
5.		TAR-Server1 transmits a Reply message containing IPv6 prefix information and a Rapid Commit option.
6.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a Renew message with the prefix given in Step 5. TAR-Server1 transmits a Reply message.

Part C: Both IA_NA and IA_PD

Step	Action	Expected Behavior
7.	Configure TAR-Client1 to disable auto configuration and enable DHCPv6 with Rapid Commit.	TAR-Client1 sends a Solicit message with a Rapid Commit option.
8.		TAR-Server1 transmits a Reply message containing IPv6 address and prefix information and a Rapid Commit option.
9.	Wait for timer T1 (50s) to expire.	TAR-Client1 transmits a Renew message with the address and prefix given in Step 8. TAR-Server1 transmits a Reply message.

Possible Problems: None.

Test DHCPInterop.2.6: DNS Options

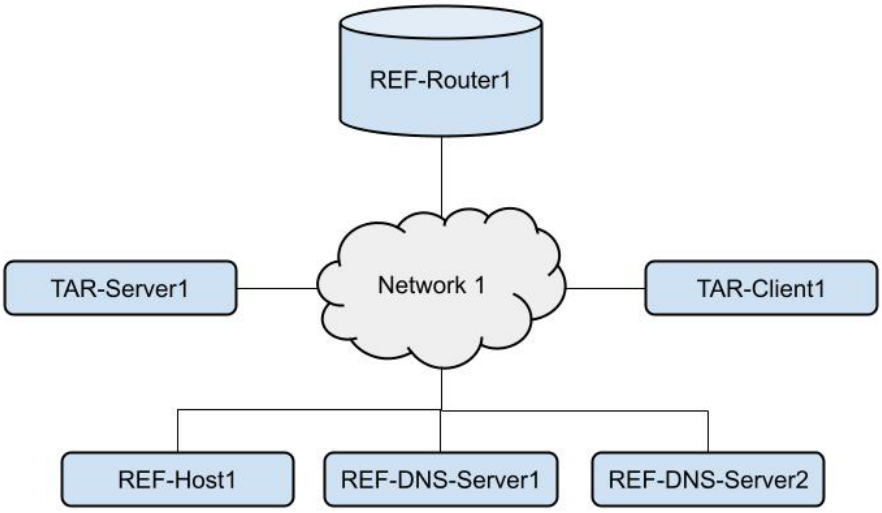
Purpose: To verify that a client can receive and use DNS options provided by the server.

Reference:

- [DHCPv6] – Sections 18.2.10, 21.7, 21.24

Node Requirements: See General Node Requirements.

Test Setup: For each part, connect the devices as per the figure below. Initialize TAR-Server1, REF-Host1 and enable DHCPv6. If TAR-Client1 does not work without the appropriate Router Advertisement, REF-Router1 can be used to transmit a Router Advertisement with the appropriate parameters on Network1. Disable DHCPv6 on all devices after test.



Procedure:

Part A – DNS Recursive Name Server Option

Step	Action	Expected Behavior
1.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address.	
2.	Configure TAR-Client1 to enable DHCPv6.	
3.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address from TAR-Server1 in the Advertise and Reply message.
4.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6.TEST.EXAMPLE.COM"	TAR-Client1 transmits a DNS Standard Query to REF-DNS-Server1.

Part B – Domain Search List Option

Step	Action	Expected Behavior
5.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address and a Domain Search List option containing "TEST.EXAMPLE.COM"	
5.	Configure TAR-Client1 to enable DHCPv6.	
6.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address and the Domain Search List option from TAR-Server1 in the Advertise and Reply message.
7.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6"	TAR-Client1 transmits a DNS Standard Query for "DHCPv6.TEST.EXAMPLE.COM" to REF-DNS-Server1.

Part C – DNS Recursive Name Server Option Updated by Renew

Step	Action	Expected Behavior
9.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address.	
8.	Configure TAR-Client1 to enable DHCPv6.	
9.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address from TAR-Server1 in the Advertise and Reply message.
10.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6.TEST.EXAMPLE.COM"	TAR-Client1 transmits a DNS Standard Query to REF-DNS-Server1.
11.	Configure TAR-Server1 to remove REF-DNS-Server1's address from the DNS Recursive Name Server option and to add REF-DNS-Server2's global address.	
12.	Wait remaining time until T1.	After T1 seconds, TAR-Client1 transmits a Renew message to TAR-Server1. TAR-Server1 sends a Reply message containing the DNS Recursive Name Server option with REF-DNS-Server2's global address.
13.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6.TEST.EXAMPLE.COM"	TAR-Client1 transmits a DNS Standard Query to REF-DNS-Server2. TAR-Client1 must not transmit a DNS Query to REF-DNS-Server1.

Part D – Domain Search List Option Updated by Renew

Step	Action	Expected Behavior

16.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address and a Domain Search List option containing "TEST.EXAMPLE.COM"	
17.	Configure TAR-Client1 to enable DHCPv6.	
18.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address and the Domain Search List option from TAR-Server1 in the Advertise and Reply message.
19.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6"	TAR-Client1 transmits a DNS Standard Query for "DHCPv6.TEST.EXAMPLE.COM" to REF-DNS-Server1.
20.	Configure TAR-Server1 to remove "TEST.EXAMPLE.COM" from the Domain Search List and to replace it with "TEST.COM".	
21.	Wait remaining time until T1.	After T1 seconds, TAR-Client1 transmits a Renew message to TAR-Server1. TAR-Server1 sends a Reply message containing the DNS Recursive Name Server option with REF-DNS-Server1's global address and a Domain Search List option with "TEST.COM".
22.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6"	TAR-Client1 transmits a DNS Standard Query for "DHCPv6.TEST.COM" to REF-DNS-Server1. TAR-Client1 must not transmit a DNS query for "DHCPv6.TEST.EXAMPLE.COM"

Part E – DNS Recursive Name Server Option Updated by Rebind

Step	Action	Expected Behavior
23.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address.	
24.	Configure TAR-Client1 to enable DHCPv6.	
25.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address from TAR-Server1 in the Advertise and Reply message.
26.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6.TEST.EXAMPLE.COM"	TAR-Client1 transmits a DNS Standard Query to REF-DNS-Server1.
27.	Configure TAR-Server1 to remove REF-DNS-Server1's address from the DNS Recursive Name Server option and to add REF-DNS-Server2's global address.	

28.	Disconnect TAR-Server1 from Network 1.	
29.	Wait remaining time until T2.	After T2 seconds, TAR-Client1 transmits a Rebind message.
30.	Reconnect TAR-Server1 to Network1.	TAR-Server1 sends a Reply message containing the DNS Recursive Name Server option with REF-DNS-Server2's global address.
31.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6.TEST.EXAMPLE.COM"	TAR-Client1 transmits a DNS Standard Query to REF-DNS-Server2. TAR-Client1 must not transmit a DNS Query to REF-DNS-Server1.

Part F – Domain Search List Option Updated by Rebind

Step	Action	Expected Behavior
32.	Configure TAR-Server1 to provide a DNS Recursive Name Server option that contains REF-DNS-Server1's global address and a Domain Search List option containing "TEST.EXAMPLE.COM"	
33.	Configure TAR-Client1 to enable DHCPv6.	
34.	Allow enough time for TAR-Client1 to receive IPv6 address information from TAR-Server1.	TAR-Client1 receives the DNS Recursive Name Server option for REF-DNS-Server1's address and the Domain Search List option from TAR-Server1 in the Advertise and Reply message.
35.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6"	TAR-Client1 transmits a DNS Standard Query for "DHCPv6.TEST.EXAMPLE.COM" to REF-DNS-Server1.
36.	Configure TAR-Server1 to remove "TEST.EXAMPLE.COM" from the Domain Search List and to replace it with "TEST.COM".	
37.	Disconnect TAR-Server1 from Network 1.	
38.	Wait remaining time until T2.	After T2 seconds, TAR-Client1 transmits a Rebind message.
39.	Reconnect TAR-Server1 to Network1.	TAR-Server1 sends a Reply message containing the DNS Recursive Name Server option with REF-DNS-Server1's global address and a Domain Search List option with "TEST.COM".
40.	Configure TAR-Client1 to transmit an Echo Request to "DHCPv6"	TAR-Client1 transmits a DNS Standard Query for "DHCPv6.TEST.COM" to REF-DNS-Server1. TAR-Client1 must not transmit a DNS Query for "DHCPv6.TEST.EXAMPLE.COM"

Possible Problems: If the NUT does not support an application for sending Echo Requests, the NUT can use an alternate application to send a DNS Standard Query.

Modification Record

Version 2.0.0

March 26, 2025

- Removed 1.5c (UseMulticast)
- Majorly refactored Relay-Agent tests
    - Broke out each topology into its own test case
    - Standardized actions and expected results
    - Included every message type in each topology
- Added 1.12 (Rebind from another server)
- Removed 2.2 (Single exchange for Multiple IA's)
- Removed 2.4 (Prefix exclude)
- Added 2.5 (Rapid Commit)
- Added 2.6 (DNS Options)
- Added Reconfigure exchanges to 2.2 (Change Addresses and Prefixes)
- Fixed numerous typos and wording issues
- Fixed numerous formatting and typos.
- Add Advanced Functionality tests and Possible Problem Summary

July 20, 2022

- Added a UseMulticast test (1.8c)
- Fixed numerous formatting and typos.

March 10, 2020

- Reformatted to updated IPv6 Ready Logo Template.
- Added a Server must transmit a Reply to a Release message in 1.5.
- Moved Appendix to another document.
- Added Group 2 for the updates from merging 3315/3633/3736.
- Merged Group 4 into Group 1.
- Removed Group 2 and Group 5 (RFC 3646)
- Moved 3.1 to 1.7.
- Added 3.2 to 1.10.
- Added 3.3 to 1.11.

Version 1.1.1

January 14, 2020

- Removed Phase-2.
- Correct Appendix

Version 1.1.0

September 15, 2009

- Added Group 4 RFC 3633 and Group 5 RFC 3633 + RFC 3646
- Removed Relay-Agent Basic Message Exchanges that includes an Interface ID Option (*Advanced)* tests.

Version 1.0.5 — August 1, 2009

- Updated Observable Results from Version 1.0.4 update.

Version 1.0.4 — November 14, 2008

- Changed Observable Results to indicate the Confirm-Reply Message does not contain an IA Option. Applies to following Test Cases:
  - Client Initiated: Transmission of Confirm messages
  - Server Initiated: Transmission of Reply messages with NotOnLink
  - Relay-Agent Basic Message Exchanges (B)
  - ADVANCED - Relay-Agent Basic Message Exchanges that includes an Interface ID Option (B)

Version 1.0.3 — August 7, 2008

- Cleaned up test setup on:
  - Relay-Agent Basic Message Exchange with DNS Configuration Options
  - Relay-Agent Basic Message Exchange with DNS Configuration Options and Interface ID Option
  - Layered Relay-Agent Basic Message Exchange with DNS Configuration Options
- Fixed topology diagram for Layered Relay-Agent Stateless DHCPv6 Basic Message Exchange with DNS Configuration Options part A and B.
- Fixed Appendix (added missing elements and reworded broken ones)
- Fixed Relay-Agent Basic Message Exchanges part F and Relay-Agent Basic Message Exchanges that includes an Interface ID Option part F by adding REF-Router1 so there is a route between networks.
- Fixed Relay-Agent Basic Message Exchanges that includes an Interface ID Option part F observable

	results.
Version 1.0.2	June 12, 2008

	• Added Parts to “Layered Relay-Agent Basic Message Exchange,” “Layered Relay-Agent Basic Message Exchange with DNS Configuration Options,” and “Layered Relay-Agent Stateless DHCPv6 Basic Message Exchange with DNS Configuration Options” to test server vs. Relay, then two test to test relay vs relay
	• Added a statement to all section 2 and 3 test setups binding “dhcpv6.test.example.com” to REF-DNS-Server1”
	• Added a check for responses to Neighbor Solicitations to:
	  • “Client Initiated: Transmission of Release Messages”
	  • “Client Initiated: Transmission of Decline Messages”
	  • “Relay-Agent Basic Message Exchange” part e and f
	  • “Relay-Agent Basic Message Exchange that includes and Interface ID Option” part e and f
	• Updated test “Layered Relay-Agent Basic Message Exchange,” “Layered Relay-Agent Basic Message Exchange with DNS Configuration Options,” and “Layered Relay-Agent Stateless DHCPv6 Basic Message Exchange with DNS Configuration Options” to use REF-Client1 instead of TAR-Client1
	• Modified Test “Client Initiated: Transmission of Decline Messages,” “Relay-Agent Basic Message Exchange” part f, and “Relay-Agent Basic Message Exchange that includes and Interface ID Option” to clarify addressing issues
	• Modified Appendix to require test “Relay-Agent Basic Message Exchange” to be run once per pair of test partners instead of twice per pair.
	• Updated “Client Initiated: Transmission of Confirm messages” and “Client Initiated: Transmission of Decline Messages” to allow for assumed status of SUCCESS when no status code is present.
	• Modified Required tests

- Client no longer needs to run:
  - “Layered Relay-Agent Basic Message Exchange”
  - “Layered Relay-Agent Basic Message Exchange with DNS Configuration Options”
  - “Layered Relay-Agent Stateless DHCPv6 Basic Message Exchange with DNS Configuration Options”
  - “Relay-Agent Basic Message Exchange that includes an Interface ID Option”
  - “Relay-Agent Basic Message Exchange with DNS Configuration Options that includes an Interface ID Option”
  - “Stateless DHCPv6 Relay-Agent Basic Message Exchange with DNS Configuration Options that includes an Interface ID Option”
- Servers and Relay-Agents are allowed to run either:
  - “Relay-Agent Basic Message Exchange” or “Relay-Agent Basic Message Exchange that includes an Interface ID Option”
  - “Relay-Agent Basic Message Exchange with DNS Configuration Options” or “Relay-Agent Basic Message Exchange with DNS Configuration Options that includes an Interface ID Option”
  - “Stateless DHCPv6 Relay-Agent Basic Message Exchange with DNS Configuration Options” or “Stateless DHCPv6 Relay-Agent Basic Message Exchange with DNS Configuration Options that includes an Interface ID Option”
- Modified Appendix to reflect changed requirements
- Removed Interface ID check from “Stateless DHCPv6 Relay-Agent Basic Message Exchange with DNS Configuration Options”
- Fixed minor typos
- Fixed typos in Test “Layered Relay-Agent Basic Message Exchange with DNS Configuration Options” part Band D, “Transmission of Renew Messages for DNS Configuration Options” part B, and “Transmission of Rebind Messages for DNS

		Configuration Options" part B, "dhcpv6" was mistyped as "dhcpv6.test.example.com" • Fixed typos in "Layered Relay-Agent Basic Message Exchange with DNS Configuration Options" part A and C, "dhcpv6.test.example.com" was mistyped as "dhcpv6" • Added Copyright
Version 1.0.1	April 26, 2007	
Version 1.0.0	April 25, 2007	