IPv6 READY

Phase II Test Specification

DHCPv6

Technical Document

Revision 1.1.0

IPv6 Forum **http://www.ipv6forum.org**

IPv6 Ready Logo Committee **http://www.ipv6ready.org**

MODIFICATION RECORD

Version 1.1.0 September 15, 2009

- Correct test sequence number Test DHCP_CONF.11.1.7 – 11.1.10
- Modify the observer result for Test DHCP_CONF.10.3.2 Part F
- Add Test DHCP_CONF.3.1.7 Part C, Test DHCP_CONF.3.1.8 Part C, Test DHCP_CONF.3.1.9 Part C, Test DHCP_CONF.3.1.10 Part C, Test DHCP_CONF.3.1.11 Part C, Test DHCP_CONF.3.1.12 Part C, Test DHCP_CONF.3.1.13 Part C, Test DHCP_CONF.6.1.3 Part C, Part F, Test DHCP_CONF.6.1.4 Part C, Part F, Test DHCP_CONF.6.1.5 Part C, Part F, Test DHCP_CONF.6.1.6 Part C, Part F, Test DHCP_CONF.9.1.6 Part C, Part F,
- Delete section 12 section 15

August 26, 2009

- Add Test DHCP_CONF.10.3.6 Part H.

August 6, 2009

- Modify procedures for Test DHCP_CONF.10.3.2 and Test DHCP_CONF.10.3.4.
- Modify the Common Test Setup
- Delete DHCP_CONF.13.1.7

August 4, 2009

- Modify procedures for DHCP_CONF.1.1.10, DHCP_CONF.1.2.1, DHCP_CONF.1.2.3, DHCP_CONF.1.2.4, DHCP_CONF.1.2.5, DHCP_CONF.1.2.6, DHCP_CONF.1.2.7, DHCP_CONF.1.2.8, DHCP_CONF.10.1.7, DHCP_CONF.10.2.1, DHCP_CONF.10.2.3, DHCP_CONF.10.2.4, DHCP_CONF.10.2.5, DHCP_CONF.10.2.6.

July 6, 2009

- Modify Advanced Functionality Tests;
- Add Test DHCP_CONF.10.3.5, Test DHCP_CONF.10.3.6, Test DHCP_CONF.11.1.3, Test DHCP_CONF.11.1.4, Test DHCP_CONF.11.1.5, Test DHCP_CONF.11.1.6, Test DHCP_CONF.11.1.7, Test DHCP_CONF.11.1.8, Test DHCP_CONF.11.1.9, Test DHCP_CONF.11.1.10, Test DHCP_CONF.11.1.11, Test DHCP_CONF.10.3.3, Part G, H, I;
- Modify DHCP_CONF.1.3.2 Part E, DHCP_CONF.10.3.2 Part G, DHCP_CONF.10.3.3 Part D, E,
- Delete DHCP_CONF.13.1.7

June 9, 2009

- Modify Advanced Functionality Tests;
- Modify References;
- Modify Common Topology(Client);
- Modify Test DHCP_CONF.1.1.1 Part C, Test DHCP_CONF.1.1.1 Part D, Test DHCP_CONF.10.1.2 Part A, Test DHCP_CONF.10.1.2 Part B, Test DHCP_CONF.10.1.2 Part C;

May 31, 2009

- Modify common topology for delegating router and relay agent;
- Modify Test DHCP_CONF.10.3.2 Part A, Test DHCP_CONF.10.3.4

Part A, Test DHCP_CONF.10.3.4 Part B

May 25, 2009

- Add new section 13 for Requesting Router;
- Add new section 14 for Delegating Router;
- Add new section 15 for Relay Agent;

April 27, 2009

- Modify observable result for DHCP_CONF.2.1.8,

April 22, 2009

- Modify procedures for DHCP_CONF.10.1.1 Part C, DHCP_CONF.10.1.2, DHCP_CONF.10.2.1, DHCP_CONF.10.2.2, DHCP_CONF.10.2.4, DHCP_CONF.10.2.5, DHCP_CONF.10.3.2, DHCP_CONF.11.1.2, DHCP_CONF.11.2.1, DHCP_CONF.11.2.2, DHCP_CONF.11.3.1, DHCP_CONF.11.3.2, DHCP_CONF.11.3.3, DHCP_CONF.11.3.8, DHCP_CONF.12.1.3, DHCP_CONF.12.1.4, DHCP_CONF.12.1.5,
- Add new test cases for DHCP_CONF.10.1.3, DHCP_CONF.10.1.4, DHCP_CONF.10.1.5, DHCP_CONF.10.1.6, DHCP_CONF.10.1.7, DHCP_CONF.10.2.2, DHCP_CONF.10.2.4 PartB,C,D, DHCP_CONF.10.2.5 PartB,C,D, DHCP_CONF.10.2.6 PartB,C,D, DHCP_CONF.10.3.3 PartA,B,F, DHCP_CONF.10.3.5, DHCP_CONF.10.3.6, DHCP_CONF.11.1.2, DHCP_CONF.11.1.3, DHCP_CONF.11.1.4, DHCP_CONF.11.1.5, DHCP_CONF.11.1.6, DHCP_CONF.11.1.7, DHCP_CONF.11.1.8, DHCP_CONF.11.1.9, DHCP_CONF.11.2.1 PartB,C,D,E, DHCP_CONF.12.3.8, DHCP_CONF.11.3.9, DHCP_CONF.11.3.10, DHCP_CONF.11.3.11, DHCP_CONF.11.3.12, DHCP_CONF.12.1.3, DHCP_CONF.12.1.4, DHCP_CONF.12.1.13,

March 17, 2009

- Modify procedures for DHCP_CONF.7.1.8, DHCP_CONF.2.3.15, DHCP_CONF.8.1.15, DHCP_CONF.3.1.15, DHCP_CONF.9.1.8

March 12, 2009

- Modify references for DHCP_CONF10.2.1, DHCP_CONF10.2.3, DHCP_CONF10.3.2, DHCP_CONF10.3.3, DHCP_CONF10.3.4, DHCP_CONF11.1.1, DHCP_CONF11.2.1, DHCP_CONF11.2.2, DHCP_CONF11.2.3, DHCP_CONF11.3.1

March 5, 2009

- Modify Advanced Functionality Tests
- Modify Common Test Setup
- Remove Interface-ID refer test cases for relay agent, DHCP_CONF3.1.5, DHCP_CONF3.1.6, DHCP_CONF3.1.7B, DHCP_CONF3.1.8B, DHCP_CONF3.1.9B, DHCP_CONF3.1.10B, DHCP_CONF3.1.11B, DHCP_CONF3.1.12B, DHCP_CONF3.1.13B, DHCP_CONF3.1.14B, DHCP_CONF3.1.15B, DHCP_CONF6.1.1B,E, DHCP_CONF6.1.2B,E, DHCP_CONF6.1.3B,E, DHCP_CONF6.1.4B,E, DHCP_CONF6.1.5B,E, DHCP_CONF6.1.6B,E, DHCP_CONF9.1.5B,E, DHCP_CONF9.1.6B,E, DHCP_CONF9.1.7B,E,

DHCP_CONF9.1.8,B,E and refer observable result, DHCP_CONF3.1.5, DHCP_CONF3.1.6, DHCP_CONF3.1.7B, DHCP_CONF3.1.8B, DHCP_CONF3.1.9B, DHCP_CONF3.1.10B, DHCP_CONF3.1.11B, DHCP_CONF3.1.12B, DHCP_CONF3.1.13B, DHCP_CONF3.1.14B, DHCP_CONF3.1.15B, DHCP_CONF6.1.1B,E, DHCP_CONF6.1.2B,E, DHCP_CONF6.1.3B,E, DHCP_CONF6.1.4B,E, DHCP_CONF6.1.5B,E, DHCP_CONF6.1.6B,E, DHCP_CONF9.1.5B,E, DHCP_CONF9.1.6B,E, DHCP_CONF9.1.7B,E, DHCP_CONF9.1.8,B,E

- Remove "advanced" for server in DHCP_CONF2.1.12 DHCP_CONF2.2.1F, DHCP_CONF2.2.2C, DHCP_CONF8.1.10, DHCP_CONF8.1.12E
- Remove DHCP_CONF1.1.2 DHCP_CONF1.1.3 DHCP_CONF7.1.2 for "M" & "O" bit.
- Add Test Section 12 for Relay Agent for DHCPv6 PD
- Add destination port for each test part in DHCP_CONF.1.3.6
- Add Information-Request into DHCP_CONF.1.3.6 proposal
- Modify DHCP_CONF.1.2.4.A, DHCP_CONF.1.3.3A, B, K, DHCP_CONF_3.1.3, DHCP_CONF_3.1.15, DHCP_CONF_8.1.11 Setup
- Modify DHCP_CONF.1.2.4 Observable result Part A, DHCP_CONF.2.3.7 Observable result Part C, DHCP_CONF_3.1.7 Observable result Part A, DHCP_CONF_3.1.8 Observable result Part A, DHCP_CONF_3.1.9 Observable result Part A, DHCP_CONF_3.1.10 Observable result Part A, DHCP_CONF_3.1.11 Observable result Part A, DHCP_CONF_3.1.12 Observable result Part A, DHCP_CONF_3.1.13 Observable result Part A

February 14, 2009

- Add Test Section 10 for Requesting router for DHCPv6 PD
- Add Test Section 11 for Delegating router for DHCPv6 PD
- Add Test Section 12 for Relay Agent for DHCPv6 PD
- Add Common Test Setup 1.1 for DHCPv6 PD
- Add Common Topology for DHCPv6 PD
- Add Reference for DHCPv6 PD
- Add Acknowledgements for DHCPv6 PD contribution

Version 1.0.4 January 23, 2009

- Modified Common Test Setup 1.2
- Modified Test DHCP_CONF 1.1.2, DHCP_CONF 1.2.4 Observable Result Part A, DHCP_CONF 1.1.12, DHCP_CONF 1.2.1 Part A, B, DHCP_CONF 1.2.3 Part A, DHCP_CONF 1.2.4 Part A, DHCP_CONF 1.2.5 Part A, DHCP_CONF 1.2.6 Part A, DHCP_CONF 1.2.7 Part A, DHCP_CONF 1.2.8 Part A, DHCP_CONF 1.3.2, DHCP_CONF 1.3.3, DHCP_CONF 1.3.6
- Modified Test DHCP_CONF 2.1.1 Part B, DHCP_CONF 2.1.6, DHCP_CONF 2.3.1, DHCP_CONF 2.3.2 Part C, DHCP_CONF 2.3.3 Part A, Part B, DHCP_CONF 2.3.6 Part B, DHCP_CONF 2.3.7 Part B,

C, DHCP_CONF 2.3.15

- Modified Test DHCP_CONF 3.1.2 Part C, DHCP_CONF 3.1.3 DHCP_CONF 3.1.9, DHCP_CONF 3.1.10, DHCP_CONF 3.1.11, DHCP_CONF 3.1.12, DHCP_CONF 3.1.13, DHCP_CONF 3.1.14, DHCP_CONF 3.1.15, DHCP_CONF 3.1.16
- Modified Test DHCP_CONF 5.1.4, 5.1.5
- Modified Test DHCP_CONF 6.1.3 Part A, B, C, D, E, F, DHCP_CONF 6.1.4 Part A, B, C, D, E, F, DHCP_CONF 6.1.5 Part A, B, C, D, E, F, DHCP_CONF 6.1.6 Part A, B, C, D, E, F
- Modified Test DHCP_CONF 7.1.2, DHCP_CONF 7.1.6
- Modified Test DHCP_CONF 8.1.1, DHCP_CONF 8.1.11 Part A., DHCP_CONF 8.1.12 and DHCP_CONF 8.1.15
- Modified Test DHCP_CONF 9.1.1, 9.1.2 Part A, B, C, 9.1.3, 9.1.4, 9.1.5, 9.1.8 Part A, B, C, D, E, F, 9.1.9
- Added DHCP_CONF 3.1.6
- Added DHCP_CONF 4.1.4 Procedure Part C
- Added DHCP_CONF 4.1.4 Procedure Part D
- Added DHCP_CONF 4.1.9 Procedure Part C
- Added DHCP_CONF 4.1.9 Procedure Part D
- Added DHCP_CONF 4.1.9 Procedure Part E
- Added DHCP_CONF 4.1.9 Procedure Part F
- Added DHCP_CONF 9.1.6
- Added DHCP_CONF 3.1.6 Observable Results
- Added DHCP_CONF 4.1.4 Observable Results Part C
- Added DHCP_CONF 4.1.4 Observable Results Part D
- Added DHCP_CONF 4.1.9 Observable Results Part C
- Added DHCP_CONF 4.1.9 Observable Results Part D
- Added DHCP_CONF 4.1.9 Observable Results Part E
- Added DHCP_CONF 4.1.9 Observable Results Part F
- Added DHCP_CONF 9.1.6 Observable Results
- Fixed editorial typos

Version 1.0.3 July 25, 2008

- Added Copyright
- Modified Acknowledgements
- Fixed editorial typos

Version 1.0.2 September 19, 2007

- Modified Test DHCP_CONF.1.2.4 Procedure Part E
- Modified Test DHCP_CONF.1.2.7 Observable Results Part E
- Modified Test DHCP_CONF.1.2.8 Observable Results Part E
- Removed Test DHCP_CONF.1.3.3 Part D and Part E

Version 1.0.1 August 16, 2007

- Modified Test DHCP_CONF.1.3.3 Procedure Part D

- Modified Test DHCP_CONF.1.2.7 Observable Results Part E
- Modified Test DHCP_CONF.1.2.8 Observable Results Part E

Version 1.0.0 April 27, 2007

- Added Test DHCP_CONF.5.1.3 and 8.1.11
- Modified Test DHCP_CONF.2.1.3 Observable Results Part B
- Modified Test DHCP_CONF.3.1.2 Observable Results Part C
- Modified Test DHCP_CONF.8.1.3 Observable Results Part B
- Modified Test DHCP_CONF.9.1.2 Observable Results Part C

Version 1.0.0b1 March 15, 2007

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The IPv6 Forum would like to acknowledge the efforts of the following organizations in the development of this test specification.

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INTRODUCTION

Overview

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 provide the market a strong signal proving the level of interoperability across various products.

To avoid confusion in the mind of customers, a globally unique logo program should be defined. The IPv6 logo will give confidence to users that IPv6 is currently operational. It will also be a clear indication that the technology will still be used in the future. To summarize, this logo program will contribute to the feeling that IPv6 is available and ready to be used.

The IPv6 Logo Program consists of three phases:

Phase I
In a first stage, the Logo will indicate that the product includes IPv6 mandatory core protocols and can interoperate with other IPv6 implementations.

Phase II
The "IPv6 ready" step implies a proper care, technical consensus and clear technical references. The IPv6 ready logo will indicate that a product has successfully satisfied strong requirements stated by the IPv6 Logo Committee (v6LC).

To avoid confusion, the logo "IPv6 Ready" will be generic. The v6LC will define the test profiles with associated requirements for specific functionalities.

Phase III
Same as *Phase II* with IPsec mandated.

Abbreviations and Acronyms

TN: Testing Node
TR: Testing Router
NUT: Node Under Test
DHCP: Dynamic Host Configuration Protocol
IA: Identity Association
ID: Identifier
DUID: DHCP Unique Identifier
DAD: Duplicate Address Detection

Advanced Functionality Tests

This conformance test specification consists mainly of four ADVANCED functions.
The following sections will be tested if the NUT supports the ADVANCED functions.

Address Assignment:
Section1 for Client device
Section2 for Server device
Section3 for Relay agent device

DNS configuration in parallel with Address Assignment:
Section1 and Section4 for Client device
Section2 and Section5 for Server device
Section3 and Section6 for Relay agent device

Stateless DHCPv6 for DNS configuration:
Section7 for Client device
Section8 for Server device
Section9 for Relay agent device

Prefix Delegation
Section10 for Requesting router (Client) device
Section11 for Delegating router (Server) device

DNS configuration in parallel with Prefix Delegation:
Section13 for Requesting router (Client) device
Section14 for Delegating router (Server) device

Requirements for the DHCPv6 IPv6 Ready Logo

Advanced Functionality Tests	**References**
Adv-1	RFC3315
Adv-2	RFC3315+RFC3646
Adv-3	RFC3736
Adv-4	RFC3633
Adv-5	RFC3633+RFC3646

*These may be combined.
Test cases of Prefix Delegation function for a Relay Agent are under review now; anyone can contact us when they found the demand for it.

Tests performed on Client/Server/Relay-Agent

	Adv-1			Adv-2			Adv-3			Adv-4		Adv-5	
	Client	Server	Relay-Agent	Client	Server	Relay-Agent	Client	Server	Relay-Agent	Requesting router(client)	Delegation router(Server)	Requesting router(client)	Delegation router(Server)
Section1	X												
Section2		X											
Section3			X										
Section4				X									
Section5					X								
Section6						X							
Section7							X						
Section8								X					
Section9									X				
Section10										X			
Section11											X		
Section13												X	
Section14													X

TEST ORGANIZATION

This document organizes tests by Section 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 and title comprise the first line of the test block. The test label is composed by concatenating the short test suite name, the section number, the group number, and the test number within the group. These elements are separated by periods. The Test Number is the section, group and test number, also separated by periods.
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.
Resource Requirements:	The Resource Requirements section specifies the software, hardware, and test equipment that will be needed to perform the test.
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:	This section of the test description 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, which are interpreted in accordance with the observable results given for that test part.
Observable Results:	This section lists observable results that can be examined by the tester to verify that the RUT is operating properly. When multiple observable results are possible, this section provides a short discussion on how to interpret them. The determination of a pass or fail for each test is usually based on how the RUT's behavior compares to the results described in this section.
Possible Problems:	This 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 this text:

- Request for Comments 3315 - Dynamic Host Configuration Protocol for IPv6 (DHCPv6), July, 2003.
- Request for Comments 3646 - DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), December, 2003
- Request for Comments 3736 - Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6, April, 2004.
- Request for Comments 3633 – IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6, December, 2003.
- Request for Comments 4862 - IPv6 Stateless Address Autoconfiguration, September 2007
- Request for Comments 4443 - Internet Message Control Protocol (ICMPv6) for the Internet Protocol version 6 (IPv6) Specification, March 2006

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Requirements
To obtain the IPv6 Ready Logo Phase-2 for DHCPv6, the Node Under Test (NUT) must satisfy all of the following requirements.

Equipment Type
There are three possibilities for equipment types:

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

DHCP relay agent (or 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 (or server):
A node that responds to requests from clients, and may or may not be on the same link as the client(s).

Common Topology (Client Test Cases)

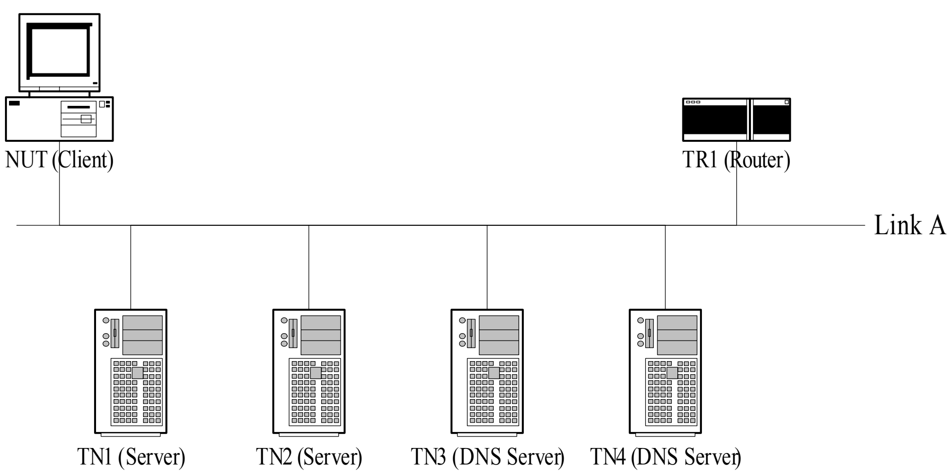


Figure 1 Common Topology 1 for DHCPv6 client

The common topology 1 involves client and server device(s) on the same link.

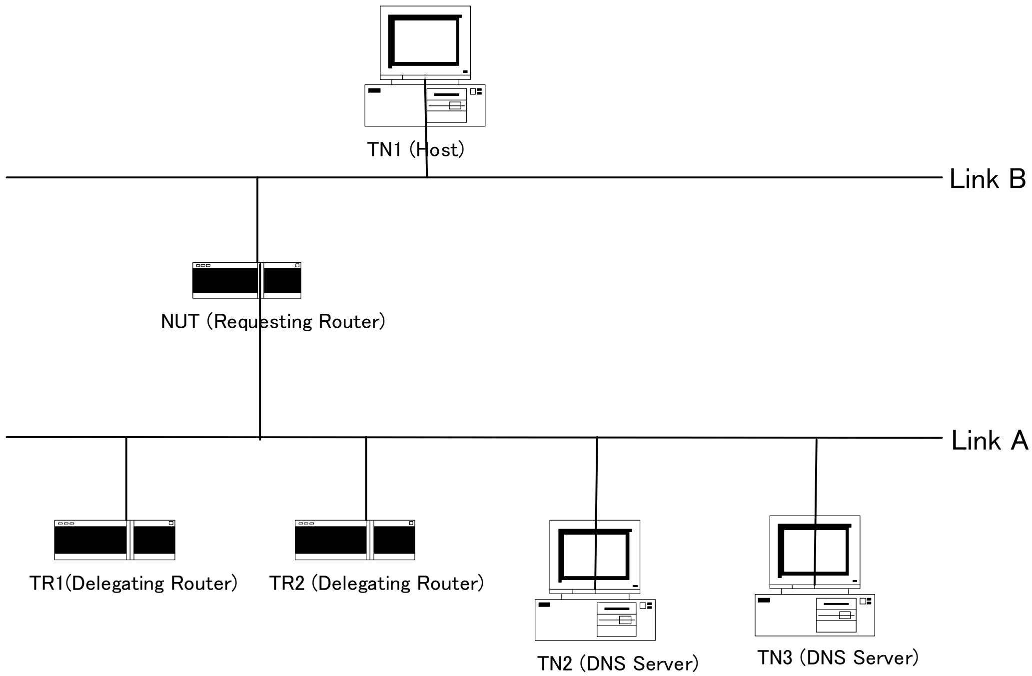


Figure 2 Common Topology 2 for Requesting router

The common topology 2 involves a Requesting Router (Client) and Delegating Routers (Servers) connected to the first link. The Requesting Router is connected to a Host on the second link.

Common Topology (Server Test Cases)

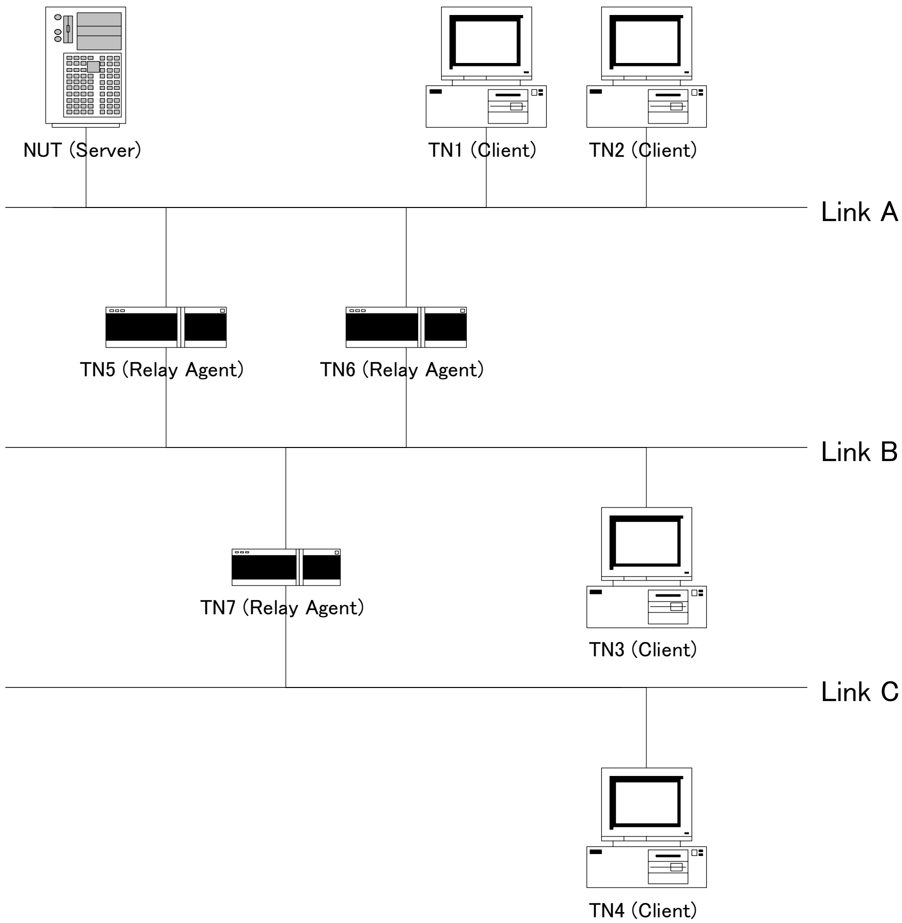


Figure 3 Common Topology 1 for DHCPv6 server

The common topology involves client, server and relay agent device(s) on the each link.

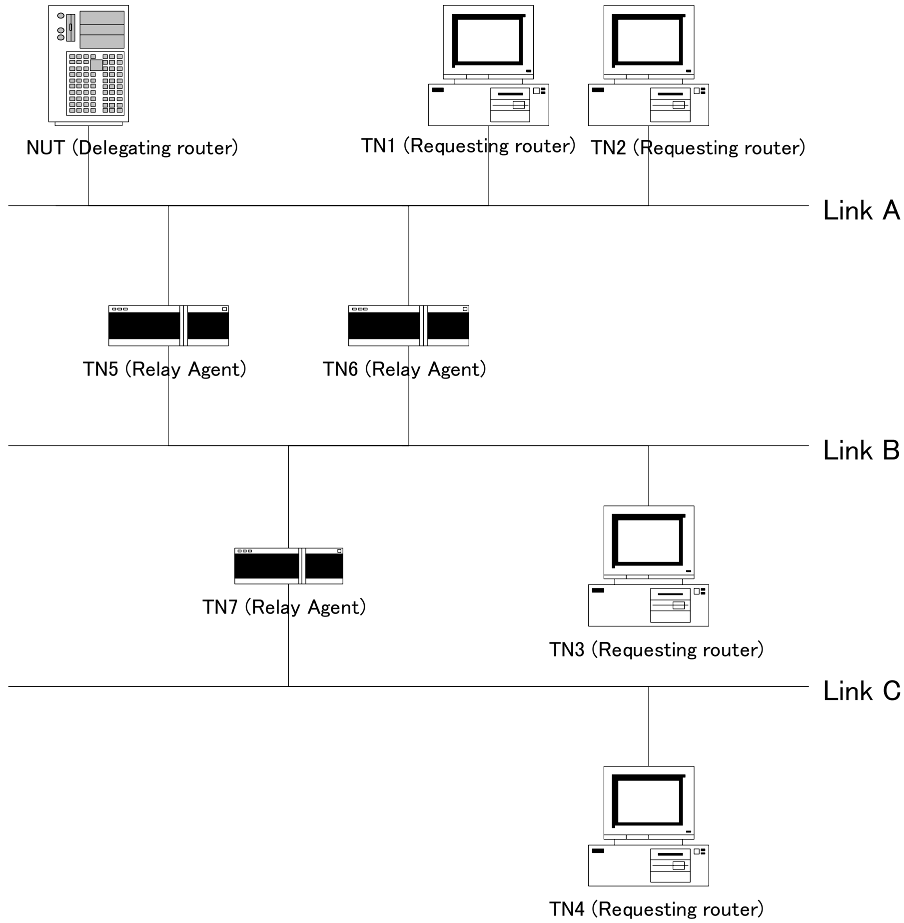


Figure 4 Common Topology 2 for Delegating router

The common topology involves requesting router, delegating router and relay agent device(s) on the each link.

Common Topology (Relay Agent Test Cases)

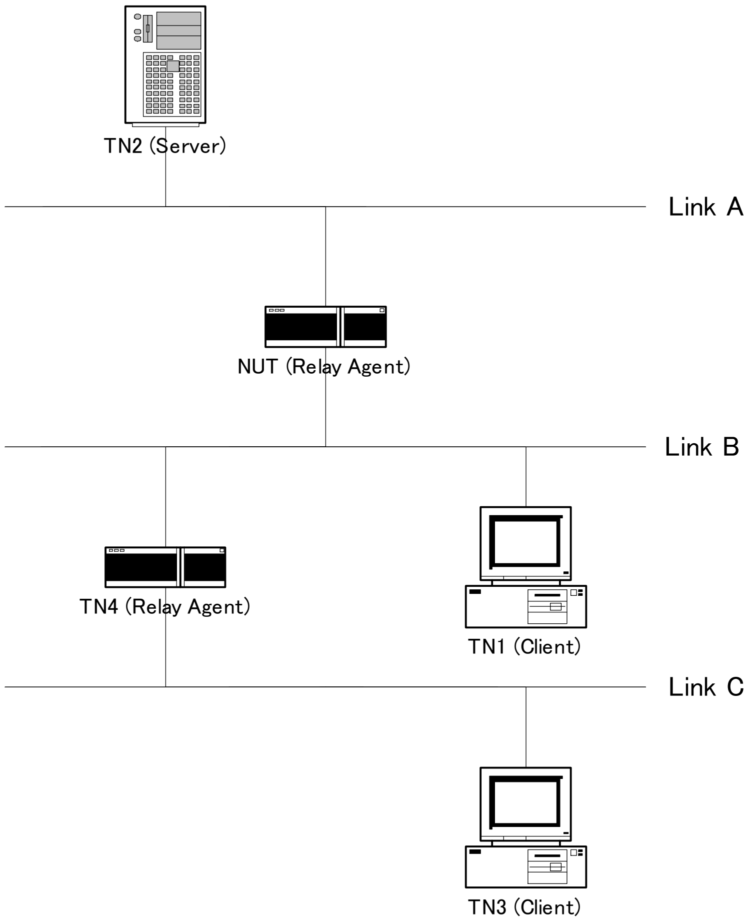


Figure 5 Common Topology 1 for Relay Agent

The common topology involves client, server and relay agent device(s) on the each link.

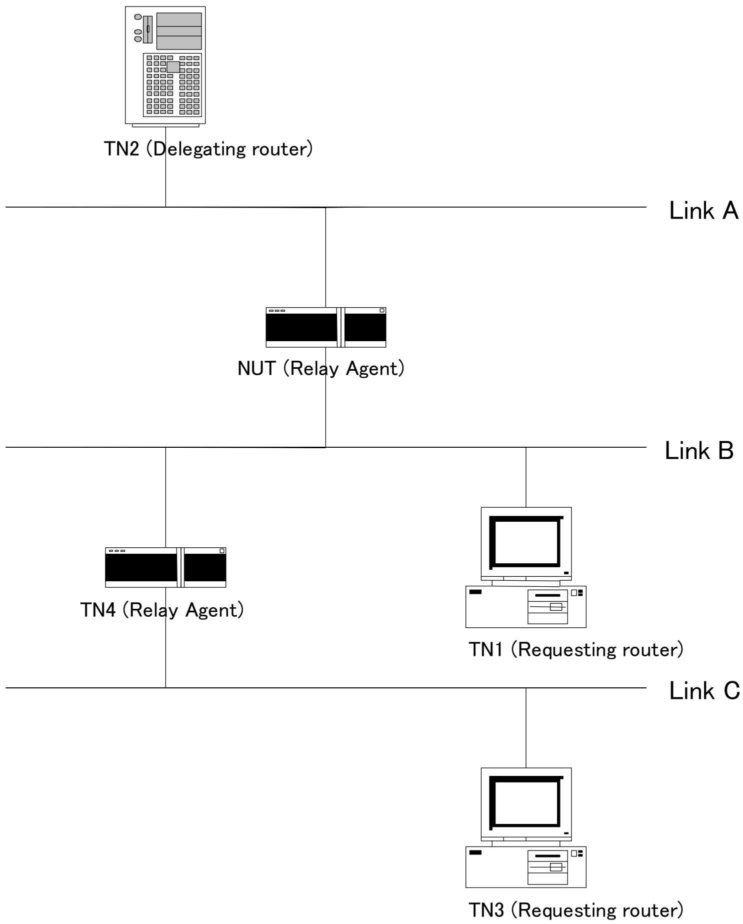


Figure 6 Common Topology 2 for Relay Agent

The common topology involves requesting router, delegating router and relay agent device(s) on the each link.

Common Test Setup

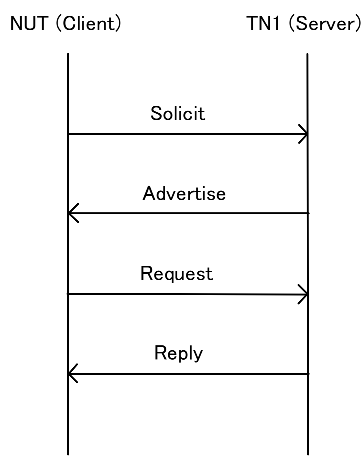
Tests in this test suite may refer to a common test setup procedure defined for this section.

Common Test Setup 1.1

Summary: This minimal setup procedure describes a proper Solicit - Advertise - Request - Reply exchange between the NUT and TN1 for a client and server tests,
and in the case of Relay agent tests this minimal setup procedure describes a proper Solicit - Relay-forward Solicit - Relay-reply Advertise - Advertise - Request - Relay-forward Request - Relay-reply Reply - Reply exchange between TN1 and the NUT and TN2,
and in the case of Requesting router tests this minimal setup procedure describes a proper Solicit - Advertise - Request - Reply exchange between the NUT and TR1 for a requesting router and delegation router tests. After that, NUT also uses a RA to configure the prefix to the TN1.

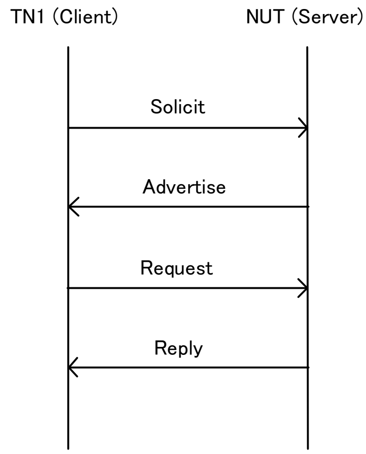
1. If the NUT is a client:

Enable DHCPv6 on the NUT (client). The NUT transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2). TN1 responds with an Advertise message. The NUT then sends a Request message to TN1 asking for confirmed assignment of addresses and other configuration information. TN1 responds with a Reply message that contains the confirmed addresses and configuration. The Reply message contains an IA_NA option with T1 set to 50 seconds and T2 set to 80 seconds.



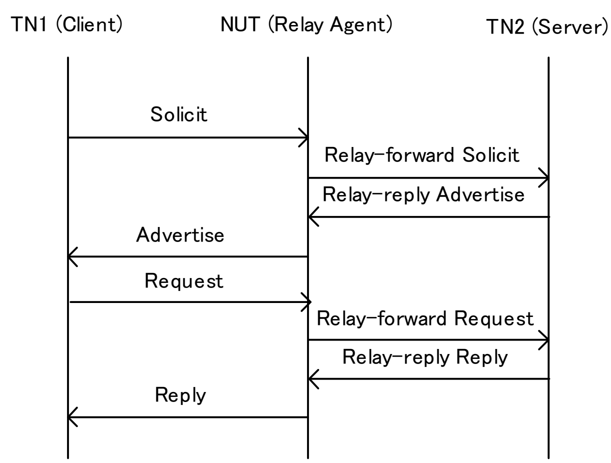
2. If the NUT is a Server (delegating router):

Configure a global address for the interface of the NUT. Configure an IPv6 global unicast address prefix on the NUT. (e.g., 2001:DB8:ffff::/48 (based on RFC3849)). Enable DHCPv6 on the NUT (server). The TN1 transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2). NUT responds with an Advertise message. TN1 then sends a Request message to the NUT asking for confirmed assignment of addresses and other configuration information. The NUT responds with a Reply message that contains the confirmed addresses and configuration.



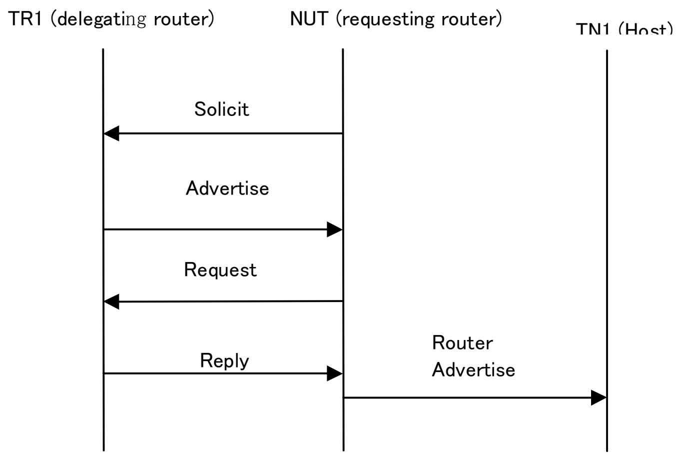
3. If the NUT is a Relay agent:

Enable DHCPv6 on the NUT (Relay Agent). The TN1 transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2). The NUT relays with a Relay-forward Solicit message to the "All_DHCP_Servers" multicast address (FF05::1:3). The TN2 responds with a Relay-reply Advertise message. The NUT relays with an Advertise message to TN1. The TN1 then sends a Request message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) asking for confirmed assignment of addresses and other configuration information. The NUT relays with a Relay-forward Request message to the "All_DHCP_Servers" multicast address (FF05::1:3). The TN2 responds with a Relay-reply Reply message and the Relay-reply Reply message contains the confirmed addresses and configuration. The NUT relays with a Reply message to TN1.



4. If the NUT is a requesting router:

Enable DHCPv6 on the NUT (requesting router). The NUT transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2). TR1 responds with an Advertise message. The NUT then sends a Request message to TR1 asking for confirmed assignment of prefixes and other configuration information. TR1 responds with a Reply message that contains the confirmed prefixes and configuration. The Reply message contains an IA_PD option with T1 set to 50 seconds and T2 set to 80 seconds. After that, Nut split the prefix into a sub prefix and transmits a router advertisement on the link. TN1 will get a RA and generate a suitable address.

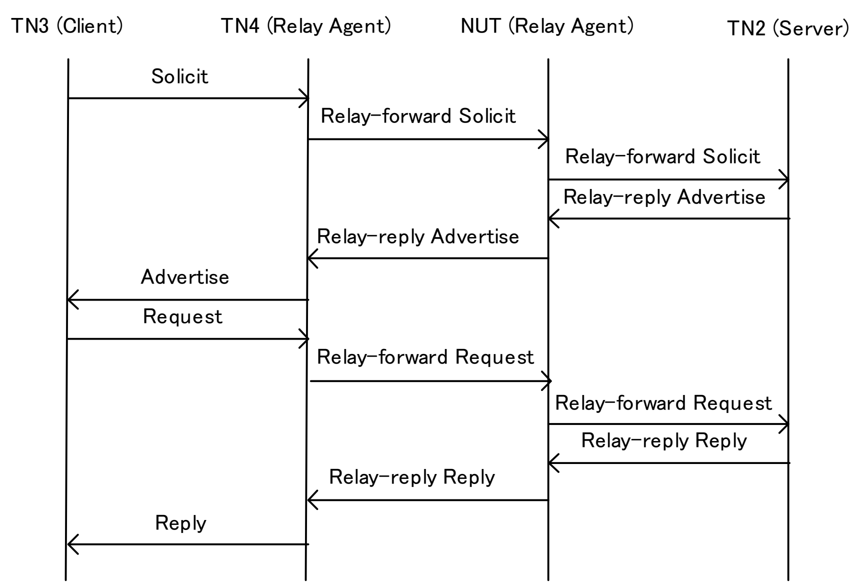


Common Test Setup 1.2

Summary: This minimal setup procedure describes a proper message exchange between TN3 and TN4 and the NUT and TN2.

1. If the NUT is a Relay agent:

Enable DHCPv6 on the NUT (Relay Agent). The TN3 transmits a Solicit message to the “All_DHCP_Relay_Agents_and_Servers” multicast address (FF02::1:2). The TN4 relays with a Relay-forward Solicit message to the “All_DHCP_Relay_Agents_and_Servers” multicast address (FF02::1:2). The NUT relays with a Relay-forward Solicit message to the “All_DHCP_Servers” multicast address (FF05::1:3). The TN2 responds with a Relay-reply Advertise message. The NUT relays with a Relay-reply Advertise message to TN4. The TN4 relays with an Advertise message to TN3. The TN3 then sends a Request message to the “All_DHCP_Relay_Agents_and_Servers” multicast address (FF02::1:2) asking for confirmed assignment of addresses and other configuration information. The TN4 relays with a Relay-forward Request message to the “All_DHCP_Relay_Agents_and_Servers” multicast address (FF02::1:2). The NUT relays with a Relay-forward Request message to the “All_DHCP_Servers” multicast address (FF05::1:3). The TN2 responds with a Relay-reply Reply message contains the confirmed addresses and configuration. The NUT relays with a Relay-reply Reply message to TN4.The TN4 relays with a Reply message to TN3.



Section 1: RFC 3315 - Client Specification

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3315.
The scope of the tests includes major functionality groups such as client behavior in client-initiated configuration exchange, client behavior in server-initiated configuration exchange, client behavior in server solicitation, and message validation by client. The section provides test cases to verify the operation of DHCPv6 clients' functionality most commonly implemented in practice.
The section is structured mainly with regard to the above functionality groups. The organization of this section however will tend to depart from the organization of RFC 3315 when grouping based on considerations of test setup and procedure is applied.

Overview

These tests are designed to verify the readiness of a DHCPv6 client implementation vis-à-vis the base specifications of the Dynamic Host Configuration Protocol for IPv6.

Group 1: Client Basic Behaviors, Constants and Format

Scope

The following tests focus on the DHCP Basic behaviors, constants and format. The messages that are sent by the client will locate servers that will assign the IPv6 addresses and/or additional configuration information pertaining to client IAs. Tests in this section are focused on client devices.

Test DHCP_CONF.1.1.1: Basic Message Exchange

Purpose: To verify a DHCP client device properly handles the reception of Reply messages during a basic message exchange.

References:

- [DHCP 3315] – Sections 17.1.4,18.1.8 and 19.4.5

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the client device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Valid Reply message in response to Request.

1. Common Test Setup 1.1 is performed.
2. Observe the messages transmitted on link A.
3. TN1 transmits an Echo Request to the NUT's Global Address.
4. Observe the messages transmitted on Link A.

Part B: Valid Reply message in response to Confirm message

5. Common Test Setup 1.1 is performed.
6. The NUT should have received IPv6 address information from TN1
7. Physically disconnect the NUT from the link on the proper interface. (This can also be achieved by disabling and re-enabling the network interface)
8. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to the Link A.
9. Upon reception of a Confirm message from the NUT, TN1 transmits a properly formatted Reply message.
10. TN1 transmit an Echo Request to the NUT's Global Address.
11. Observe the messages transmitted on Link A.

Part C: Valid Reply message in response to a Renew message.

12. Common Test Setup 1.1 is performed.
13. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT’s IA (TN1 sets T1 to 50s and T2 to 80s).
14. Upon reception of a Renew message from the NUT at time T1, TN1 transmits a properly formatted Reply message.
15. TN1 transmits an Echo Request to NUT's Global Address.
16. Observe the messages transmitted on Link A.

Part D: Valid Reply message in response to a Rebind message.

17. Common Test Setup 1.1 is performed.
18. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT’s IA (TN1 sets T1 to 50s and T2 to 80s).
19. Upon reception of a Rebind message from the NUT at time T2, TN1 transmits a properly formatted Reply message.
20. TN1 transmits an Echo Request to NUT's Global Address.
21. Observe the messages transmitted on Link A.

Part E: Valid Reply message in response to a Release message.

22. Common Test Setup 1.1 is performed.
23. The NUT should have received IPv6 address information from TN1.
24. Configure the client to release the IPv6 address.
25. Upon reception of the NUT's Release message, TN1 transmits a properly formatted Reply message to the NUT.
26. From TN1, transmit an ICMPv6 Echo Request to the NUT for the released address.
27. Observe the messages transmitted on Link A.

Part F: Valid Reply message in response to a Decline message.

28. Common Test Setup 1.1 is performed.
29. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
30. Upon reception of the NUT's Decline message, TN1 transmits a properly formatted Reply message to the NUT.
31. TN1 transmits an ICMPv6 Echo Request to the NUT for the configured address.
    Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 2: The NUT should perform duplicate address detection on each of the addresses in any IAs it receives in the Reply message from TN1 before using that address for traffic. The NUT transmitted DAD NS for each of its addresses.
  Step 4: The NUT should transmit an Echo Reply to TN1.
- *Part B*
  Step 11: The NUT transmitted an Echo Reply in response to the Echo Request from TN1.
- *Part C*
  Step 16: The NUT transmitted an Echo Reply in response to the Echo Request from TN1.
- *Part D*
  Step 21: The NUT transmitted an Echo Reply in response to the Echo Request from TN1.
- *Part E*
  Step 27: Upon reception of the Echo Request message from TN1 to the released address, the NUT did not send an Echo Reply message.
- *Part F*
  Step 32: Upon reception of the Echo Request message from TN1 to the configured address, the NUT did not send an Echo Reply message.

Possible Problems:

- None.

Test DHCP_CONF.1.1.2: Implementation of DHCP constants

Purpose: To verify that the client listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.1, 5.2 and 13
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Multicast Addresses

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Valid UDP port

3. Enable DHCPv6 on the NUT.
4. Observe the messages transmitted on Link A.
5. Upon reception of a Solicit message from the NUT, TN1 transmits an Advertise message to UDP port 546.
6. Observe the messages transmitted on Link A.

Part C: Invalid UDP port

7. Enable DHCPv6 on the NUT.
8. Upon reception of a Solicit message from the NUT, TN1 transmits an Advertise message to UDP destination port 33536.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 1: The NUT must transmit a Solicit message with a destination address set to the "ALL_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
- *Part B*

  Step 4: The NUT must transmit a Solicit message with a destination UDP port set to 547.
  Step 6: The NUT must process the correct Advertise message and transmit a Request Message to TN1.

- *Part C*

  Step 9: The NUT should send a Destination Unreachable message to TN1 link-local address. The source address of the packet must be the NUT's unicast address. The code field must be set to "4" port unreachable and the invoking advertise packet included in the Error Message must not exceed minimum IPv6 MTU.

Possible Problems:

- None.

Test DHCP_CONF.1.1.3: Client Message Format

Purpose: To verify that the client transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6 and 16

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following elements:

- Source Address set to Link-Local
- The msg-type field was set to the value of 1 (Solicit)
- A header containing a non-zero value Transaction ID

Possible Problems:

- None.

Test DHCP_CONF.1.1.4: Client Identifier Option Format

Purpose: To verify that the DHCP client transmits the correct Client Identifier Option format.

References:

- [DHCP 3315] – Section 22.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following Client Identifier option values:

- An option-code set to OPTION_CLIENTID (1)
- An option-length set to length of DUID in octets
- DUID Field set to any non-zero number

Possible Problems:

- None.

Test DHCP_CONF.1.1.5: Client DHCP Unique Identifier Contents

Purpose: To verify the format of the DHCP Client's DUID-LLT, DUID-EN and DUID-LL option.

References:
- [DHCP 3315] – Sections 9.2, 9.3 and 9.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: DUID-LLT Format
1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Part B: DUID-LLT Consistency

3. Enable DHCPv6 on the NUT.
4. Observe the messages transmitted on Link A.
5. Reboot the NUT.
6. Enable DHCPv6 on the NUT.
7. Observe the messages transmitted on Link A.

Part C: *DUID-EN Format*

8. Enable DHCPv6 on the NUT.
9. Observe the messages transmitted on Link A.

Part D: DUID-EN Consistency

10. Enable DHCPv6 on the NUT.
11. Observe the messages transmitted on Link A.
12. Reboot the NUT.
13. Enable DHCPv6 on the NUT.
14. Observe the messages transmitted on Link A.

Part E: DUID-LL Format

15. Enable DHCPv6 on the NUT.
16. Observe the messages transmitted on Link A.

Part F: DUID-LL Consistency

17. Enable DHCPv6 on the NUT.
18. Observe the messages transmitted on Link A.
19. Reboot the NUT.
20. Enable DHCPv6 on the NUT.
21. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following DUID-LLT option:
  - An option-code set to OPTION_CLIENTID(1)

- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x01
- A hardware type set to the IANA-assigned value
- A time value of DUID
- A link-layer address

- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing the following DUID-LLT option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IANA-assigned value
  - A time value of DUID
  - A link-layer address

  Step 7: The NUT must transmit a Solicit message with the DUID-LLT option containing the same values as in Step 4.
- *Part C*

  Step 9: The NUT transmits a properly formatted Solicit message containing the following DUID-EN option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IANA value
  - A non-zero identifier number of the DUID
- *Part D*

  Step 11: The NUT transmits a properly formatted Solicit message containing the following DUID-EN option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IANA value
  - A non-zero identifier number of the DUID

  Step 14: The NUT must transmit a Solicit message with the DUID-EN option containing the same values as in Step 11.
- *Part E*

  Step 16: The NUT transmits a properly formatted Solicit message containing the following DUID-LL option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x03
  - A hardware type set to the IANA-assigned value
  - A link-layer address of DUID
- *Part F*

  Step 18: The NUT transmits a properly formatted Solicit message containing the following DUID-LL option:

- An option-code set to OPTION_CLIENTID(1)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IANA-assigned value
- A link-layer address of DUID

Step 21: The NUT must transmit a Solicit message with the DUID-LL option containing the same values as in Step18.

Possible Problems:

- Either of the following tests is executed according to the DUID type of the client.

  - Client DUID type is DUID-LLT
    Part A and Part B
  - Client DUID type is DUID-EN
    Part C and Part D
  - Client DUID type is DUID-LL
    Part E and Part F

Test DHCP_CONF.1.1.6: IA_NA Option Format

Purpose: To verify that the DHCP client transmits the correct IA_NA Option format.

References:

- [DHCP 3315] – Section 17.1.1 and 22.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following IA_NA option values:

- An option-code set to OPTION_IA_NA (3)
- An option-length set to 12 + length of IA_NA options field
- An IAID value set to a non-zero number
- Time T1 set to a number
- Time T2 set to a number

Possible Problems:

- None.

Test DHCP_CONF.1.1.7: Identity Association Consistency

Purpose: To verify that the IAID for the IA is consistent across all restarts of the DHCP client.

References:

- [DHCP 3315] – Section 10

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.
3. Disable the NUT.
4. Enable DHCPv6 on the NUT.
5. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following IA_NA option values:

- An option-code set to OPTION_IA_NA (3)
- An option-length set to 12 + length of IA_NA options field
- An IAID value set to a non-zero number

Step 5: The NUT transmits a properly formatted Solicit message containing the same IAID value as Step 2.

Possible Problems:

- None.

Test DHCP_CONF.1.1.8: Server Identifier Option Format

Purpose: To verify that the DHCP client transmits the correct Server Identifier Option format.

References:

- [DHCP 3315] – Section 22.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.
3. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message including a Server Identifier Option.
4. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message.
Step 4: The NUT transmits a properly formatted Request message containing the following Server Identifier option values:

- An option-code set to OPTION_SERVERID (2)
- An option-length set to length of DUID in octets
- DUID Field set to DUID for the Server

Possible Problems:

- None.

Test DHCP_CONF.1.1.9: IA Address Option Format

Purpose: To verify that the DHCP client transmits the correct IA Address Option format.

References:

- [DHCP 3315] – Section 18.1.3 and 22.6

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.1 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

1. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 80s).
2. Wait T1 (50) seconds.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Renew message containing the following IA Address option values:

- An option-code set to OPTION_IAADDR (5)
- An option-length set to 24 + length of IAaddr-options field
- Any Valid IPv6 Address
- A preferred lifetime
- A valid lifetime

Possible Problems:

- None.

Test DHCP_CONF.1.1.10: Elapsed Time Option Format

Purpose: To verify that the DHCP client transmits the correct Elapsed Time Option format.

References:
- [DHCP 3315] – Section 22.9，5.5 and 14.

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Elapsed Time Option in Solicit message
1. Enable DHCPv6 on the NUT.
2. Observe the First Solicit message transmitted on Link A.

Part B: Elapsed Time Option in Request message
3. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
4. Observe the first Request message transmitted on Link A.

Part C: Elapsed Time Option in Confirm message
5. Common Test Setup 1.1 is performed, and The NUT should have received IPv6 address information from TN1.
6. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
7. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
8. Observe the message transmitted on Link A.

Part D: Elapsed Time Option in Renew message
9. Common Test Setup 1.1 is performed before each part with the values T1=50s and T2=2500s (preferred lifetime and valid lifetime are greater than T1 and T2).
10. The NUT should have received IPv6 address information from TN1 in Step 6. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 2500s).
11. After time T1, observe the message transmitted on Link A.

Part E: Elapsed Time Option in Rebind message
12. Common Test Setup 1.1 is performed before each part.
13. TN1 does not respond to any Renew messages transmitted after T1.
14. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Part F: Elapsed Time Option in Release message
15. Common Test Setup 1.1 is performed before each part.
16. Verify that the NUT is configured with the received IPv6 address information from TN1.
17. Configure the client to release the IPv6 address.
18. Observe the messages transmitted on Link A.

Part G: Elapsed Time Option in Decline message
19. Common Test Setup 1.1 is performed before each part.
20. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
21. Observe the messages transmitted on Link A.

Part H: Maximum Elapsed Time in elapsed-time field

22. Common Test Setup 1.1 is performed before each part with the values T1=50s and T2=2500s (preferred lifetime and valid lifetime are greater than T1 and T2).
23. The NUT should have received IPv6 address information from TN1 in Step 6. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 2500s).
24. After time T1, observe the messages transmitted on Link A until 8 Renew messages received or 1256 (0xffff + REN_MAX_RT) seconds elapsed since the first Renew message was received.

Observable Results:

- *Part A*

  Step 2: The NUT transmits properly formatted Solicit messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part B*

  Step 4: The NUT transmits properly formatted Request messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part C*

  Step 8: The NUT transmits a properly formatted Confirm message containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part D*

  Step 11: The NUT transmits properly formatted Renew messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part E*

  Step 14: The NUT transmits properly formatted Rebind messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part F*

Step 18: The NUT transmits properly formatted Release messages containing the following Elapsed Time option values:

- An option-code set to OPTION_ELAPSED_TIME (8)
- An option-length set to 2
- An elapsed time set to a number

- *Part G*

  Step 21: The NUT transmits properly formatted Decline messages containing the following Elapsed Time option values:

  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part H*

  Step 24: The NUT transmitted a first Renew message containing an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Renew messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Renew message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Renew message was received.

Possible Problems:

- None.

Group 2: Client Message Transmission

Scope

The following tests focus on the Client message creation, transmission and termination of DHCP IPv6 exchanges. The messages that are sent by the client will locate servers that will assign the IPv6 addresses and/or additional configuration information pertaining to client IAs. Tests in this section are focused on client devices.

Test DHCP_CONF.1.2.1: Transmission of Solicit Messages

Purpose: To verify a client device transmits properly formatted Solicit messages and properly follows the retransmission algorithm for Solicit messages.

References:

- [DHCP 3315] – Sections 5.5, 14, 15.1, 16, 17.1, 17.1.1, 17.1.2 and 22.9

Test Setup: Connect the network according to the Common Topology. DHCPv6 is enabled on the client device before each part. DHCPv6 on the client device is disabled after each part.

Procedure:

Part A: Solicit message format

1. Enable DHCPv6 on the NUT.
2. Observe the first Solicit message transmitted on Link A.

Part B: Reliability of DHCPv6 Retransmission

3. Enable DHCPv6 on the NUT.
4. Observe the first Solicit message transmitted on Link A.
5. Wait for second Solicit message.
6. Observe the second Solicit message transmitted on Link A.

Part C: Retransmission of Solicit Message

7. Enable DHCPv6 on the NUT.
8. Observe the time the first Solicit message was transmitted on Link A.
9. Wait for second Solicit message.
10. Observe the time the second Solicit message was transmitted on Link A.

Part D: Maximum Retransmission Time of Solicit Message

11. Enable DHCPv6 on the NUT.
12. Continue to capture Solicit messages until RTprev= MRT + MRT*RAND (108 <= RTprev <=132).
13. Observe the messages transmitted on Link A.
14. Continue to capture Solicit messages until 776(0xffff+SOL_MAX_RT) seconds elapsed since the first Solicit message was received.
15. Observe the Elapsed Time Option in Solicit message transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following elements:
    - Src Address is a link-local for that interface
    - The msg-type field was set to the value of 1 (Solicit)
    - A header containing a Transaction ID
    - A Client Identifier Option (containing DUID)
    - An Elapsed Time Option
- *Part B*

Step 4: The NUT transmits a properly formatted Solicit message containing the following elements:

- Src Address is a link-local for that interface
- The msg-type field was set to the value of 1 (Solicit)
- A header containing a Transaction ID
- A Client Identifier Option (containing a DUID)
- An Elapsed Time Option

Step 6: The NUT transmits a properly formatted Solicit message with the same values as in Step 4. The transaction ID is the same for all retransmitted messages.

- *Part C*

Step 8: The NUT transmits a properly formatted Solicit message.

Step 10: The NUT transmits a properly formatted Solicit message according to the Second message in the chart below.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 1.0)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1) = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part D*

Step 13: The NUT should properly transmit Solicit messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 1.0 sec)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1 sec) = IRT + RAND*IRT Where IRT=1, RAND= +.1
X message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120
X+1 message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120

Step 15: The first Solicit message containing an Elapsed Time option with its elapsed-time value set to 0, and the followed Solicit messages' elapsed-time value set to the time elapsed since the first Solicit message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Solicit message was received. The elapsed-time value of these Solicit messages should be in the range of the follow chat:

Solicit message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second	Value=1000ms	Value=1100ms

message	=IRT+RAND*IRT Where IRT=1s, RAND=0	= IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2900ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff
| |	Value=0xffff	Value=0xffff

Possible Problems:
None.

Test DHCP_CONF.1.2.2: Message Exchange Termination for Solicit messages

Purpose: To verify that a DHCPv6 client device properly implements the mechanism for message exchange termination for Solicit messages.

References:

- [DHCP 3315] – Sections 14 and 17.1.2

Test Setup: Connect the network according to the Common Topology. DHCPv6 is enabled on the client device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Receives Advertise message without Preference Option before first RT elapse

1. Enable DHCPv6 on the NUT.
2. Wait until the NUT transmits a Solicit message.
3. TN1 immediately transmits an Advertise message that does not include a Preference Option.
4. Observe the messages transmitted on Link A.

Part B: Receives Advertise message without Preference Option after first RT elapse

5. Enable DHCPv6 on the NUT
6. Wait until the NUT transmits a second Solicit message.
7. TN1 transmits an Advertise message that does not include a Preference Option.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 4: The NUT must wait IRT + RAND*IRT (greater than 1.0) seconds before transmitting a Request message. The NUT must not transmit a Request message immediately after receiving the Advertise message from the Server.
- *Part B*
  Step 8: The NUT must transmit a Request message immediately after receiving the Advertise message from the Server.

Possible Problems:

- If the NUT is configured with either MRC or MRD set to a value other than 0, the NUT will terminate the message exchange according to section 14 of RFC 3315; therefore the above test cases would not apply.

Test DHCP_CONF.1.2.3: Transmission of Request messages

Purpose: To verify that a client device transmits properly formatted Request messages and properly implements the mechanism for message exchange termination for Request messages.

References:

- [DHCP 3315] – Sections 5.5, 14 , 18.1.1 and 22.9

Test Setup: Connect all devices according to the Common Topology. Enable DHCPv6 on the client device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Request message format

1. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
2. Observe the messages transmitted on Link A.

Part B: Retransmission of Request messages

3. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
4. Observe the messages transmitted on Link A until second Request message received.

Part C: Maximum Retransmission Time of Request messages

5. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
6. Continue to capture Request messages until RTprev= MRT + MRT*RAND (27 <= RTprev <=33).
7. Observe the messages transmitted on Link A.

Part D: Maximum Retransmission Count of Request messages

8. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
9. Continuously observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Request message to TN1 containing:
  - The msg-type field was set to the value of 3 (Request)
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - A Server Identifier Option (containing a DUID)
  - An Elapsed Time Option
- *Part B*

  Step 4: The NUT transmits a properly formatted Request message according to the Second message in the chart below.

Request Message	Minimum Delay	Maximum Delay

First message	-	-
Second message	0.9 = IRT + RAND*IRT Where IRT=1, RAND=-.1	1.1 = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part C*

  Step 7: The NUT should properly transmit Request messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Request Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	27 seconds =.9*MRT where MRT=30	33 seconds =1.1*MRT where MRT=30
X+1 message	27 seconds =.9*MRT where MRT=30	33 seconds =1.1*MRT where MRT=30

- *Part D*

  Step 9: The NUT must terminate the message exchange after the transmission of REQ_MAX_RC (10) Request messages. The NUT must not transmit any more Request messages.

  The elapsed-time value of these Request messages should be in the range of the follow chat:

Request message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms=RT+0 RT=IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms=RT+0 RT= IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
10th message	Value>Valueprev	Value>Valueprev

Possible Problems:

- None.

Test DHCP_CONF.1.2.4: Transmission of Confirm messages

Purpose: To verify a client device transmits properly formatted Confirm messages and properly implements the mechanism for message exchange termination for Confirm messages.

References: [DHCP 3315] – Sections 5.5, 14 and 18.1.2

Test Setup: Connect the network according to the Common Topology. Common Test Setup 1.1 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Confirm message format

1. The NUT should have received IPv6 address information from TN1.
2. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
3. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
4. Observe the messages transmitted on Link A.

Part B: Retransmission of Confirm messages

5. The NUT should have received IPv6 address information from TN1.
6. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
7. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
8. Observe messages transmitted on Link A until second Confirm message received.

Part C: Maximum Retransmission Time of Confirm messages

9. The NUT should have received IPv6 address information from TN1.
10. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
11. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
12. Continue to capture Confirm messages until RTprev=MRT + MRT*RAND (3.6 <= PTprev <=4.4).
13. Observe messages transmitted on Link A.

Part D: Maximum Retransmission Duration of Confirm messages

14. The NUT should have received IPv6 address information from TN1.
15. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
16. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
17. Observe messages transmitted on Link A for 15 seconds.

Part E: Reserved Address Information

18. The NUT should have received IPv6 address information from TN1.
19. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)

20. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
21. After reception of the first Confirm message, TN1 transmits an Echo Request to the NUT's Global Address obtained in Step 18 after CNF_MAX_RD elapsed.
22. Observe messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a DAD NS for its Link-Local address and then transmits a properly formatted Confirm Message between 0 and CONF_MAX_DELAY (1 second) after DAD processing to TN1 containing:
  - The "msg-type" field was set to the value of 4 (Confirm)
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - An IA Address Option with the proper IPv6 address associated with the IA and the preferred-lifetime and valid-lifetime fields was set to 0.
  - An Elapsed Time Option

- *Part B*

  Step 8: The NUT transmits a properly formatted Confirm Message according to the Second Message in the chart below.

Confirm Message	Minimum Delay	Maximum Delay
First message	0 seconds	CNF_MAX_DELAY(1 sec)
Second message	0.9 seconds = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 seconds = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part C*

  Step 13: The NUT should properly transmit Confirm messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Confirm Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	3.6 seconds =.9*MRT where MRT=4	4.4 seconds =1.1*MRT where MRT=4
X+1 message	3.6 seconds =.9*MRT where MRT=4	4.4 seconds =1.1*MRT where MRT=4

  X+1 message that after CNF_MAX_RD (10 seconds) is not observed.

- *Part D*

  Step 17: The NUT must terminate the message transmission of Confirm message after CNF_MAX_RD (10 seconds). The NUT must not transmit any more Confirm messages.

The elapsed-time value of these Confirm messages should be in the range of the follow chat:

Confirm message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms=RT+0 RT=IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms=RT+0 RT= IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Last message	Value>Valueprev	Value =10000ms

- *Part E*

  Step 22: The NUT SHOULD continue using its IP address and transmit an Echo Reply to TN1.

Possible Problems:

- None.

Test DHCP_CONF.1.2.5: Transmission of Renew messages

Purpose: To verify a client device properly transmits Renew messages.

References:
- [DHCP 3315] – Sections 5.5, 14 and 18.1.3

Test Setup: Connect all devices according to the Common Topology. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Renew message format.
1. Common Test Setup 1.1 is performed before each part with the values T1=50s and T2=80s.
2. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
3. After time T1 observe the messages transmitted Link A.

Part B: Retransmission of Renew message, T1 and T2 non-zero.
4. Common Test Setup 1.1 is performed before each part with the values T1=50s and T2=80s.
5. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
6. Observe the messages transmitted on Link A until second Renew message received.

Part C: Maximum Retransmission Time of Renew message, T1 and T2 non-zero.
7. Common Test Setup 1.1 is performed before each part with the values T1=40s and T2=2000s.
8. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 40s and T2 to 2000s).
9. Observe the messages transmitted on Link A for time T2.

Part D: Maximum Retransmission Duration of Renew message, T1 and T2 non-zero.
10. Common Test Setup 1.1 is performed before each part with the values T1=100s and T2=200s.
11. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 100s and T2 to 200s).
12. Observe the messages transmitted on Link A for time T2.

Observable Results:

- *Part A*

  Step 3: The NUT should send its first Renew message T1 (50) seconds after the reception of the Reply message from TN1.The NUT transmits a properly formatted Renew message to TN1 containing:
  - A "msg-type" field set to the value of RENEW (5)
  - A header containing a Transaction ID
  - A Server Identifier Option (containing a server DUID)
  - A Client Identifier Option (containing a client DUID)
  - An IA Address Option with the proper IPv6 address associated with the IA.
  - An Elapsed Time Option

- *Part B*

  Step 6: The NUT transmits properly formatted Renew message according to the Second Message in the chart below.

Renew Message	Minimum Delay	Maximum Delay
First message	Time T1	Time T1
Second message	9 seconds = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 seconds = IRT + RAND*IRT Where IRT=10, RAND= +.1

- *Part C*

  Step 9: The NUT should properly transmit Renew messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Renew Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	9 = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 = IRT + RAND*IRT Where IRT=10, RAND= +.1
| |	| |	| |
X message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600
X+1 message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600

X+1 message that after T2 (2000 seconds) is not observed.

The first Renew message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Renew messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Renew message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Renew message was received. The elapsed-time value of these Renew messages should be in the range of the follow chat:

Renew message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=9000ms =IRT+RAND*IRT Where IRT=10s, RAND=-0.1	Value=11000ms = IRT+RAND*IRT Where IRT=10s, RAND=0.1
Third message	Value=26100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=34100ms =Valueprev+ RT RT=2*RTprev+RAND*RTpre v Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff
| |	Value=0xffff	Value=0xffff

- *Part D*

  Step 12: The NUT must terminate the message transmission of Renew message after MRD (Remaining time until T2). The NUT must not transmit any more Renew messages.

  The transaction ID is the same for all retransmitted messages.

Possible Problems:

- None.

Test DHCP_CONF.1.2.6: Transmission of Rebind message

Purpose: To verify a client device properly transmits Rebind messages.

References:

- [DHCP 3315] – Sections 5.5, 14 and 18.1.4

Test Setup: Connect the network according to the Common Topology. Common Test Setup 1.1 is performed before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Rebind message format

1. The NUT should have received IPv6 address information from TN1.
2. TN1 does not respond to any Renew messages transmitted after T1.
3. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Part B: Retransmission of Rebind messages, T1 and T2 non-zero.

4. The NUT should have received IPv6 address information from TN1.
5. TN1 does not respond to messages transmitted after T1.
6. After time T2 (30s (T2-T1) after renew message), observe the messages transmitted on Link A until second Rebind message received.

Part C: Maximum Retransmission Time of Rebind messages, T1 and T2 non-zero.

7. The NUT should have received IPv6 address information with valid lifetime 3000s from TN1.
8. TN1 does not respond to messages transmitted after T1.
9. After time T2 (30s (T2-T1) after renew message, observe the messages transmitted on Link A.

Part D: Maximum Retransmission Duration Retransmission of Rebind messages, T1 and T2 non-zero.

10. The NUT should have received IPv6 address information with valid lifetime 300s from TN1.
11. TN1 does not respond to messages transmitted after T1.
12. After time T2 (30s (T2-T1) after renew message), observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The time from when the NUT receives the Reply message from TN1 to when the NUT transmits the Rebind message is equivalent to T2.

  The NUT transmits a properly formatted Rebind message to TN1 containing
  - A "msg-type" field set to the value of REBIND (6).
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - An IA Address Option with the proper IPv6 address associated with the IA
  - An Elapsed Time Option
- *Part B*

  Step 6: The NUT transmits a properly formatted Rebind Message according to the Second Message in the chart below.

Rebind Message	Minimum Delay	Maximum Delay
First message	Time T2 after Reply	Time T2 after Reply
Second message	9 seconds = IRT + RAND*IRT Where IRT=10, RAND=-.1	11 seconds = IRT + RAND*IRT Where IRT=10, RAND= +.1

- *Part C*

Step 9: The NUT should properly transmit Rebind messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Rebind Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	9 = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 = IRT + RAND*IRT Where IRT=10, RAND= +.1
| |	| |	| |
X message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600
X+1 message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600

X+1 message that after valid lifetime (3000 seconds) is not observed.
The first Rebind message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Rebind messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Rebind message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Rebind message was received. The elapsed-time value of these Rebind messages should be in the range of the follow chat:

Rebind message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=9000ms =IRT+RAND*IRT Where IRT=10s, RAND=-0.1	Value=11000ms = IRT+RAND*IRT Where IRT=10s, RAND=0.1
Third message	Value=26100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=34100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff
| |	Value=0xffff	Value=0xffff

- *Part D*

Step 12: The NUT must terminate the message transmission of Rebind message after MRD (Remaining time until valid lifetimes of all addresses have expired). The NUT must not transmit any more Rebind messages.

The transaction ID is the same for all retransmitted messages.

Note: After the valid lifetimes of all addresses in the IA have expired, the client may choose to use a Solicit message to locate a new DHCP server and send a Request for the expired IA to the new server, or the client may have other addresses in other IAs, so the client may choose to discard the expired IA and use the addresses in the other IAs.

Possible Problems:

- None.

Test DHCP_CONF.1.2.7: Transmission of Release messages

Purpose: To verify that a client device transmits properly formatted Release messages and properly implements the mechanism for retransmission and message exchange termination for Release messages; to verify that a client device properly releases Ipv6 addresses configured by a server.

References:

- [DHCP 3315] – Sections 5.5, 14 and 18.1.6

Test Setup: Connect all devices according to the Common Topology. Common Test Setup 1.1 is performed before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Release message format

1. Verify that the NUT is configured with the received IPv6 address information from TN1.
2. Configure the client to release the IPv6 address.
3. Observe any messages transmitted on Link A.

Part B: Release of received address

4. Verify that the NUT is configured with the received IPv6 address information from TN1.
5. Configure the client to release the IPv6 address.
6. Observe any messages transmitted on Link A.
7. TN1 transmits an ICMPv6 Echo Request to the NUT for the released address.
8. Observe the messages transmitted on Link A.

Part C: Retransmission of Release message

9. Verify that the NUT is configured with the received IPv6 address information from TN1.
10. Configure the client to release the IPv6 address.
11. Observe the messages transmitted on Link A until second Release message received.

Part D: Maximum Retransmission Count of Release message, no Reply message from Server

12. Verify that the NUT is configured with the received IPv6 address information from TN1.
13. Configure the client to release the IPv6 address.
14. Continuously observe the messages transmitted on Link A.

Part E: Retransmission and message exchange termination, Server responds with Reply message

15. Verify that the NUT is configured with the received IPv6 address information from TN1.
16. Configure the client to release the IPv6 address.
17. Upon reception of the NUT's second Release message, TN1 transmits a Reply message to the NUT that includes a Status Code option with value NoBinding for each IA in the NUT's Release message.
18. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Release message to TN1 containing:
  - A "msg-type" field set to the value of 8 (RELEASE).
  - A header containing a Transaction ID.

- A Client Identifier Option (containing a DUID)
- A Server Identifier Option
- An IA Address Option with the proper IPv6 address associated with the IA
- An Elapsed Time Option

- *Part B*

  Step 6: The NUT transmits a properly formatted Release message to TN1.
  Step 8: The NUT must not reply to the Echo Request.

- *Part C*

  Step 11: The NUT transmits a properly formatted Release Message according to the Second Message in the chart below.

Release Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 seconds = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 seconds = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part D*

  Step 14: The NUT must terminate the message exchange after the transmission of REL_MAX_RC (5) Release messages. The NUT must not transmit any more Release messages. The transaction ID is the same for all retransmitted messages.
  The first Release message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Release messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Release message was received, The elapsed-time value of these Release messages should be in the range of the follow chat:

Release message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms =IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms = IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
4th message	Value=5859ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=8051ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
5th message	Value=12032ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=17798ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1

- *Part E*

  Step 18: The NUT ceases the transmission of Release messages upon reception of the Reply message from TN1.

Possible Problems:
None.

Test DHCP_CONF.1.2.8: Transmission of Decline messages

Purpose: To verify a client device properly creates transmits Decline messages.

References:

- [DHCP 3315] – Sections 5.5, 14, 18.1.7 and 18.1.8

Test Setup: Connect the network according to the Common Topology. Common Test Setup 1.1 is performed before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Decline message format

1. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
2. Observe any messages transmitted on Link A.

Part B: Decline of received address

3. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
4. Observe any messages transmitted on Link A.
5. TN1 transmits an ICMPv6 Echo Request to the same IPv6 address in the Reply message from TN1.
6. Observe the messages transmitted on Link A.

Part C: Retransmission of Decline message

7. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
8. Observe the messages transmitted on Link A until second Decline message received.

Part D: Maximum Retransmission Count of Decline message, no Reply message from Server

9. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
10. Continuously observe the messages transmitted on Link A.

Part E: Retransmission and message exchange termination, Server responds with Reply message

11. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
12. Upon reception of the NUT's second Decline message, TN1 transmits a Reply message to the NUT that includes a Status Code option with NoBinding.
13. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Decline message to TN1 containing:

    - A link-local source address, not the tentative address in Step 1
    - A "msg-type" field set to the value of 9 (DECLINE)
    - A header containing a Transaction ID
    - A Client Identifier Option (containing a DUID)
    - A Server Identifier Option
    - An IA Address Option with the IPv6 address acquired in Step 1 and the proper IA association
    - An Elapsed Time Option

- *Part B*

Step 4: The NUT transmits a properly formatted Decline message to TN1.
Step 6: The NUT must not reply to the ICMPv6 Echo Request transmitted from TN1.

- *Part C*

  Step 8: The NUT transmits a properly formatted Decline Message according to the Second Message in the chart below.

Decline Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 seconds = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 seconds = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part D*

  Step 10: The NUT must terminate the message exchange after the transmission of DEC_MAX_RC (5) Decline messages. The NUT must not transmit any more Decline messages. The transaction ID is the same for all retransmitted messages.
  The first Decline message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Decline messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Decline message was received, The elapsed-time value of these Decline messages should be in the range of the follow chat:

Decline message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms =IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms = IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
4th message	Value=5859ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=8051ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
5th message	Value=12032ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=17798ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1

- *Part E*

  Step 13: The NUT ceases the transmission of Decline messages upon reception of the Reply message from TN1.

Possible Problems:

- None.

Group 3: Message Reception

Scope:

The following tests focus on the client's implementation of DHCPv6 and the reception of valid and invalid DHCPv6 messages by a server device.

Test DHCP_CONF.1.3.1: Reception of Advertise messages

Purpose: To verify a client device properly handles the reception of Advertise messages.

References:

- [DHCP 3315] – Sections17.1.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

1. When a Solicit message is received from the NUT, TN1 transmits a properly formatted Advertise message. The Advertise message contains a Status Code option containing the value NoAddrsAvail (code 2).
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT must silently discard the Advertise message. The NUT may display the associated status message to the user. The NUT must continue to transmit Solicit messages.

Possible Problems:

- None.

Test DHCP_CONF.1.3.2: Client Initiated Exchange - Reception of Reply messages

Purpose: To verify a client device properly handles the reception of Reply messages after initiating an exchange.

References:

- [DHCP 3315] – Section 18.1.8

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: T1 and T2 Times Recorded

1. Upon reception of the Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
2. Upon reception of the Request message from the NUT, TN1 transmits a properly formatted Reply message (T1=50, T2=80).
3. Wait 50 seconds.
4. Observe the messages transmitted on Link A.
5. Wait 30(T2-T1) seconds.
6. Observe the messages transmitted on Link A.

Part B: New Address in IA option

7. Upon reception of the Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
8. Upon reception of the Request message from the NUT, TN1 transmits a properly formatted Reply message with IA_NA option (T1=50 with one IA address option Address1).
9. Upon reception of the Renew message from the NUT, TN1 transmits a properly formatted Reply message with IA_NA option including two IA address options (Address1 and Address2).
10. TN1 transmits an Echo Request to the NUT's Address1.
11. Observe the messages transmitted on Link A.
12. TN1 transmits an Echo Request to the NUT's Address2.
13. Observe the messages transmitted on Link A.

Part C: Update Lifetimes

14. Common Test Setup 1.1 is performed.
15. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s, T2 to 80s and valid lifetime set to 200).
16. Upon reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with an IA_NA option including a IA Address option with valid lifetime set to 100 seconds.
17. TN1 transmits an Echo Request to NUT's Global Address.
18. Observe the messages transmitted on Link A.
19. Wait 110 seconds.
20. TN1 transmits an Echo Request to NUT's Global Address.
21. Observe the messages transmitted on Link A.

Part D: IA Address option- Valid Lifetime set to zero

22. Common Test Setup 1.1 is performed.
23. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s, T2 to 80s and valid lifetime set to 200).
24. Upon reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with an IA_NA option including a IA Address option with valid lifetime set to 0 seconds.
25. TN1 transmits an Echo Request to NUT's Global Address.
26. Observe the messages transmitted on Link A.

Part E: IA Address option not included in IA from Server

27. Common Test Setup 1.1 is performed.
28. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s, T2 to 80s and valid lifetime set to 200).
29. Upon reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with an IA_NA option without an IA Address option.
30. TN1 transmits an Echo Request to NUT's original Global Address.
31. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 4: The NUT transmitted a Renew message to TN1.
  Step 6: The NUT transmitted a Rebind message to TN1.
- *Part B*
  Step 11: The NUT must transmit an Echo Reply to TN1 using Address1.
  Step 13: The NUT must transmit an Echo Reply to TN1 using Address2.
- *Part C*
  Step 18: The NUT must transmit an Echo Reply to TN1.
  Step 21: The NUT must NOT transmit an Echo Reply to TN1.
- *Part D*
  Step 26: The NUT must NOT transmit an Echo Reply to TN1.
- *Part E*
  Step 31: The NUT must transmit an Renew message to TN1.

Possible Problems:

- None.

Test DHCP_CONF.1.3.3: Client Initiated Exchange - Reception of Reply messages cont'd

Purpose: To verify a client device properly handles the reception of Reply messages in a client initiated exchange.

References:

- [DHCP 3315] – Sections 18.1.8, and 19.4.5

Test Setup: Connect the devices according to the Common Topology. Common Test Setup 1.1 is performed for part D, E, F, G, H, I, J and K. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Reply message contains UnspecFail.

1. Enable DHCPv6 on NUT.
2. Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of UnspecFail.
4. Observe the messages transmitted on Link A.

Part B: Reply message contains UseMulticast.

5. Enable DHCPv6 on NUT.
6. Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
7. Upon reception of a Request message from the NUT, TN1 transmits a Reply message with a Status Code option with the value UseMulticast.
8. Observe the messages transmitted on Link A.

Part C: Reply message contains NotOnLink in response to a Request message.

9. Enable DHCPv6 on the NUT.
10. Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
11. Upon reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of NotOnLink.
12. Observe the messages transmitted on Link A.

Part D: Reply message contains NotOnLink in response to a Confirm message.

13. The NUT should have received IPv6 address information from TN1
14. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface).
15. Upon reception of a Confirm message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of NotOnLink.
16. Observe the messages transmitted on Link A.

Part E: Reply message in response to a Confirm message.

17. The NUT should have received IPv6 address information from TN1
18. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface).

19. Upon reception of a Confirm message from the NUT, TN1 transmits a properly formatted Reply message.
20. TN1 transmits an Echo Request to the NUT's Global Address.
21. Observe the messages transmitted on Link A.

Part F: Reply message contains NoBinding in response to a Renew message.

22. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
23. Upon reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of NoBinding for the IAs for which the NUT requested configuration.
24. Observe the messages transmitted on Link A.

Part G: Reply message contains NoBinding in response to a Rebind message.

25. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
26. Upon reception of a Rebind message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of NoBinding for the IAs for which the NUT requested configuration.
27. Observe the messages transmitted on Link A.

Part H: Reply message contains no IA in response to a Renew message.

28. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
29. Upon reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message that does not contain the IAs the NUT requested configuration.
30. Observe the messages transmitted on Link A.

Part I: Reply message contains no IA in response to a Rebind message.

31. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
32. Upon reception of a Rebind message from the NUT, TN1 transmits a properly formatted Reply message that does not contain the IAs the NUT requested configuration.
33. Observe the messages transmitted on Link A.

Part J: Reply message contains NoBinding in response to a Release message.

34. The NUT should have received IPv6 address information from TN1.
35. Configure the client to release the IPv6 address.
36. Upon reception of the NUT's Release message, TN1 transmits a Reply message to the NUT that includes a Status Code option with value NoBinding for the IA in the NUT's Release message.
37. Observe the messages transmitted on Link A.
38. From TN1, transmit an ICMPv6 Echo Request to the NUT for the released address.
39. Observe the messages transmitted on Link A.

Part K: Reply message contains NoBinding in response to a Decline message.

40. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
41. Upon reception of the NUT's Decline message, TN1 transmits a Reply message to the NUT that includes a Status Code option with value NoBinding for the IA in the NUT's Decline message.
42. Observe the messages transmitted on Link A.
43. From TN1, transmit an ICMPv6 Echo Request to the NUT for the released address.
44. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT must continue transmitting its Request message. The NUT must limit the rate at which it retransmits the message and limit the duration of the time during which it retransmits the message.
- *Part B*

  Step 8: The NUT should resend the original Request message to the server using multicast through the interface on which the Reply message from TN1 was received.
- *Part C*

  Step 12: The NUT should begin a DHCP server solicitation and transmit a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2), or retransmit the Request message (with the same transaction ID) without specifying any addresses.
- *Part D*

  Step 16: The NUT should begin a DHCP server solicitation and transmit a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
- *Part E*

  Step 21: The NUT transmits an Echo Reply to TN1.
- *Part F*

  Step 24: Upon reception of the Reply message from TN1, the NUT should transmit a Request message with a Server ID option identifying TN1 for each of the IAs that the NUT included in the Renew message. The NUT did not send any additional Renew messages.
- *Part G*

  Step 27: Upon reception of the Reply message from TN1, the NUT should transmit a Request message.
- *Part H*

  Step 30: Upon reception of the Reply message from TN1, the NUT should transmit a Renew message.
- *Part I*

  Step 33: Upon reception of the Reply message from TN1, the NUT should transmit a Rebind message.
- *Part J*

  Step 37: Upon reception of the Reply message from TN1, the NUT did not send any additional Release messages.

  Step 39: Upon reception of the Echo Request message from TN1 to the released address, the NUT did not send an Echo Reply message.
- *Part K*

  Step 42: Upon reception of the Reply message from TN1, the NUT did not send any additional Decline messages.

  Step 44: Upon reception of the Echo Request message from TN1 to the configured address, the NUT did not send an Echo Reply message.

Possible Problems:

- None.

Test DHCP_CONF.1.3.4: Reception of Invalid Advertise message

Purpose: To verify a client device properly handles the reception of invalid Advertise messages.

References:

- [DHCP 3315] – Sections 15, 15.3 and 17.1.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: No Server Identifier option

1. When a Solicit message is received from the NUT, TN1 transmits an Advertise message that does not contain a Server Identifier option.
2. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

3. When a Solicit message is received from the NUT, TN1 transmits an Advertise message that does not contain a Client Identifier option.
4. Observe the messages transmitted on Link A.

Part C: Client Identifier that does not match the DUID of the client

5. When a Solicit message is received from the NUT, TN1 transmits a properly formatted Advertise message. The Advertise message contains a Client Identifier option whose value does not match the client's DUID.
6. Observe the messages transmitted on Link A.

Part D: Transaction ID Mismatch

7. When a Solicit message is received from the NUT, TN1 transmits a properly formatted Advertise message. The Advertise message contains a transaction-id field value that does not match the value the client used in its Solicit message.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.
- *Part B*

  Step 4: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.
- *Part C*

  Step 6: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.
- *Part D*

Step 8: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.

Possible Problems:

- None.

Test DHCP_CONF.1.3.5: Reception of Invalid Reply message

Purpose: To verify that a client device properly handles the reception of invalid Reply messages.

References:

- [DHCP 3315] – Sections 15, 15.10, 22.4 and 22.6

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: No Server Identifier option

1. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.
2. Upon the reception of a Request message, TN1 transmits a Reply message that does not contain a Server Identifier option.
3. Observe the messages transmitted on Link A.

Part B: Transaction ID Mismatch

4. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.
5. Upon the reception of a Request message, TN1 transmits a Reply message. The Reply message contains a transaction-id field value that does not match the value the client used in its Request messages.
6. Observe the messages transmitted on Link A.

Part C: Contains invalid IA_NA option T1 > T2

7. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.
8. Upon the reception of a Request message, TN1 transmits a Reply message that contains an IA_NA option with T1 greater than T2.
9. TN1 transmits an Echo Request to the NUT's Global Address.
10. Observe the messages transmitted on Link A.

Part D: Contains invalid IA Address (preferred lifetime > valid lifetime)

11. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.
12. Upon the reception of a Request message, TN1 transmits a Reply message that contains an IA_NA option with a preferred lifetime greater than the valid lifetime.
13. TN1 transmits an Echo Request to the NUT's Global Address.
14. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must silently discard the invalid Reply message. The NUT does not assign these addresses but continued to transmit its Request message.
- *Part B*

  Step 6: The NUT must silently discard the invalid Reply message. The NUT does not assign these addresses but continued to transmit its Request message.
- *Part C*

Step 10: The NUT must silently discard the invalid IA_NA option in the Reply message. The NUT must not transmit an Echo Reply to TN1.

- *Part D*

  Step 14: The NUT must silently discard the invalid IA_Address option in the Reply message. The NUT must not transmit an Echo Reply to TN1.

Possible Problems:

- None.

Test DHCP_CONF.1.3.6: Client Message Validation

Purpose: To verify a client device properly discards all Solicit, Request, Confirm, Renew, Rebind, Decline, Release, Relay-forward, Relay-reply and Information-Request messages.

References:

- [DHCP 3315] – Sections 15.2, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.12, 15.13 and 15.14

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.1 is performed before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Solicit message (type 1)

1. The NUT should receive IPv6 address information from TN1.
2. TN1 transmits a Solicit message to the NUT port 546.
3. Observe the messages transmitted on Link A.

Part B: Request message (type 3)

4. The NUT should receive IPv6 address information from TN1.
5. TN1 transmits a Request message to the NUT port 546.
6. Observe the messages transmitted on Link A.

Part C: Confirm message (type 4)

7. The NUT should receive IPv6 address information from TN1.
8. TN1 transmits a Confirm message to the NUT port 546.
9. Observe the messages transmitted on Link A.

Part D: Renew message (type 5)

10. The NUT should receive IPv6 address information from TN1.
11. TN1 transmits a Renew message to the NUT port 546.
12. Observe the messages transmitted on Link A.

Part E: Rebind message (type 6)

13. The NUT should receive IPv6 address information from TN1.
14. TN1 transmits a Rebind message to the NUT port 546.
15. Observe the messages transmitted on Link A.

Part F: Decline message (type 9)

16. The NUT should receive IPv6 address information from TN1.
17. TN1 transmits a Decline message to the NUT port 546.
18. Observe the messages transmitted on Link A.

Part G: Release message (type 8)

19. The NUT should receive IPv6 address information from TN1.
20. TN1 transmits a Release message to the NUT port 546.
21. Observe the messages transmitted on Link A.

Part H: Relay-forward message (type 12)

22. The NUT should receive IPv6 address information from TN1.
23. TN1 transmits a Relay-forward message to the NUT port 546.
24. Observe the messages transmitted on Link A.

Part I: Relay-reply message (type 13)

25. The NUT should receive IPv6 address information from TN1.
26. TN1 transmits a Relay-reply message to the NUT port 546.
27. Observe the messages transmitted on Link A.

Part J: Information-request message (type 11)

28. The NUT should receive IPv6 address information from TN1.
29. TN1 transmits an Information-request message to the NUT port 546.
30. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 3: The NUT discards the Solicit message from TN1 and does not transmit any packets.
- *Part B*
  Step 6: The NUT discards the Request message from TN1 and does not transmit any packets.
- *Part C*
  Step 9: The NUT discards the Confirm message from TN1 and does not transmit any packets.
- *Part D*
  Step 12: The NUT discards the Renew message from TN1 and does not transmit any packets.
- *Part E*
  Step 15: The NUT discards the Rebind message from TN1 and does not transmit any packets.
- *Part F*
  Step 18: The NUT discards the Decline message from TN1 and does not transmit any packets.
- *Part G*
  Step 21: The NUT discards the Release message from TN1 and does not transmit any packets.
- *Part H*
  Step 24: The NUT discards the Relay-forward message from TN1 and does not transmit any packets.
- *Part I*
  Step 27: The NUT discards the Relay-reply messages from TN1 and does not transmit any packets.
- *Part J*
  Step 30: The NUT discards the Information-request messages from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 2: RFC 3315 - Server Specification

Scope

The following tests cover specifications for the server implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3315.

The scope of the tests includes major functionality groups such as server behavior in client-initiated configuration exchange, server behavior in server-initiated configuration exchange and message validation by server. The section provides test cases to verify the operation of DHCPv6 servers' functionality most commonly implemented in practice.

The section is structured mainly with regard to the above functionality groups. The organization of this section however will tend to depart from the organization of RFC 3315 when grouping based on considerations of test setup and procedure is applied.

Overview

These tests are designed to verify the readiness of a DHCPv6 server implementation vis-à-vis the base specifications of the Dynamic Host Configuration Protocol for IPv6.

Group 1: Server Basic Behaviors, Constants and Format

Scope

The following tests focus on the DHCP Basic Behaviors, constants and format. The messages that are sent by the client will locate servers that will assign the IPv6 addresses and/or additional configuration information pertaining to client IAs. Tests in this section are focused on server devices.
The following tests focus on the server's implementation of DHCPv6 constants and message format.

Test DHCP_CONF.2.1.1: Basic Message Exchanges

Purpose: To verify a DHCPv6 server device properly handles the reception of DHCPv6 messages during a basic message exchange.

References:

- [DHCP 3315] – Section 5.3

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Valid Advertise message in response to Solicit and valid Reply message in response to Request.

1. Common Test Setup 1.1 is performed for Server device.
2. Observe the messages transmitted on Link A, while Step1 is performed.

Part B: Valid Reply message in response to Confirm message

3. Common Test Setup 1.1 is performed for Server device.
4. TN1 transmits a valid Confirm message with an IA_NA and IA Address Option to the NUT.
5. Observe the messages transmitted on Link A.

Part C: Valid Reply message in response to a Renew message.

6. Common Test Setup 1.1 is performed for Server device.
7. TN1 transmits a valid Renew message with an IA_NA and IA Address Option to the NUT.
8. Observe the messages transmitted on Link A.

Part D: Valid Reply message in response to a Rebind message.

9. Common Test Setup 1.1 is performed for Server device.
10. TN1 transmits a valid Rebind message with an IA_NA and IA Address Option to the NUT.
11. Observe the messages transmitted on Link A.

Part E: Valid Reply message in response to a Release message.

12. Common Test Setup 1.1 is performed for Server device.
13. TN1 transmits a valid Release message with an IA_NA and IA Address Option to the NUT.
14. Observe the messages transmitted on Link A.

Part F: Valid Reply message in response to a Decline message.

15. Common Test Setup 1.1 is performed for Server device.
16. TN1 transmits a valid Decline message with an IA_NA and IA Address Option to the NUT.
17. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmitted an Advertise message in response to the Solicit message and a Reply message in response to the Request message from TN1.
- *Part B*

  Step 5: The NUT transmitted a Reply message in response to the Confirm message and the Reply message should not contain an IA_NA.
- *Part C*

Step 8: The NUT transmitted a Reply message in response to the Renew message.

- *Part D*

  Step 11: The NUT transmitted a Reply message in response to the Rebind message.
- *Part E*

  Step 14: The NUT transmitted a Reply message in response to the Release message.
- *Part F*

  Step 17: The NUT transmitted a Reply message in response to the Decline message.

Possible Problems:

- None.

Test DHCP_CONF.2.1.2: Transaction ID Consistency: Basic Exchange

Purpose: To verify a DHCPv6 server device properly uses the same transaction id as the client.

References:

- [DHCP 3315] – Section 15.1

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

1. TN1 transmits a valid solicit message (transaction-id is 100).
2. Observe the messages transmitted on Link A.
3. Upon the reception of an Advertise message from the NUT, TN1 transmits a valid Request message (transaction-id is 101).
4. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmitted an Advertise message in response to the Solicit message from TN1 with matching transaction ids (100)
Step 4: The NUT transmitted a Reply message in response to the Request message from TN1 with matching transaction ids (101).

Possible Problems:

- None.

Test DHCP_CONF.2.1.3: Implementation of DHCP constants

Purpose: To verify that the server listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.2
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Valid UDP port

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message to UDP destination port 547.
3. Observe the messages transmitted on Link A.

Part B: Invalid UDP port

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message to UDP destination port 33536.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must transmit an Advertise message with a destination UDP port set to 546.
- *Part B*

  Step 6: The NUT should silently ignore the Solicit message from TN and does not send any DHCPv6 messages.

Possible Problems:

- None.

Test DHCP_CONF.2.1.4: Server Message Format

Purpose: To verify that the server transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6, 7, 7.1, 7.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Client/Server Message Format

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
3. Observe the messages transmitted on Link A.

Part B: Relay Agent/Server Message Format

4. Enable DHCPv6 on the NUT.
5. TN5 transmits a Relay Forward Solicit message from TN3 to the NUT.
6. Observe the messages on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Advertise message containing the following elements:
  - The msg-type field was set to the value of 2 (Advertise)
  - A header containing a non-zero value Transaction ID
  - A Server Identifier Option (containing a DUID)
  - A Client Identifier Option (containing a DUID)
- *Part B*

  Step 6: The NUT transmits a properly formatted Relay Reply message containing the following elements:
  - The msg-type field was set to the value of 13(Relay-Reply)
  - Hop-count (Copied from the Relay-forward message)
  - Link-address (Copied from the Relay-forward message)
  - Peer-address (Copied from the Relay-forward message)
  - A Relay Message Option

Possible Problems:

- None.

Test DHCP_CONF.2.1.5: Server Identifier Option Format

Purpose: To verify the format of the DHCPv6 Server Identifier option.

References:

- [DHCP 3315] – Section 22.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Server Identifier option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- DUID Field set to any non-zero number

Possible Problems:

- None.

Test DHCP_CONF.2.1.6: DHCP Unique Identifier (DUID) Contents

Purpose: To verify that the DHCP server transmits the correct DUID contents.

References:

- [DHCP 3315] – Section 9

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: DUID based on Link-layer Address Plus Time [DUID-LLT] Format

1. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-LLT.
2. TN1 transmits a Solicit message.
3. Observe the messages transmitted on Link A.

Part B: DUID based on Link-layer Address Plus Time [DUID-LLT] Consistency

4. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-LLT.
5. TN1 transmits a Solicit message.
6. Observe the messages transmitted on Link A.
7. Reboot the NUT
8. Enable DHCPv6 on the NUT.
9. TN1 transmits a Solicit message.
10. Observe the messages transmitted on Link A.

Part C: DUID assigned by vendor based on Enterprise Number [DUID-EN] Format

11. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-EN.
12. TN1 transmits a Solicit message.
13. Observe the messages transmitted on Link A.

Part D: DUID assigned by vendor based on Enterprise Number [DUID-EN] Consistency

14. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-EN.
15. TN1 transmits a Solicit message.
16. Observe the messages transmitted on Link A.
17. Reboot the NUT
18. Enable DHCPv6 on the NUT.
19. TN1 transmits a Solicit message.
20. Observe the messages transmitted on Link A.

Part E: DUID based on Link-layer Address [DUID-LL] Format

21. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-LL.
22. TN1 transmits a Solicit message.
23. Observe the messages transmitted on Link A.

Part F: DUID based on Link-layer Address [DUID-LL] Consistency

24. Enable DHCPv6 on the NUT. Configure the type of DUID used by the server to be DUID-LL.
25. TN1 transmits a Solicit message.
26. Observe the messages transmitted on Link A.
27. Reboot the NUT
28. Enable DHCPv6 on the NUT.

29. TN1 transmits a Solicit message.
30. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Advertise message containing the following DUID-LLT option:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IANA-assigned value
  - A time value of DUID
  - A Link-layer address
- *Part B*

  Step 6: The NUT transmits a properly formatted Advertise message containing the following DUID option values:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IANA-assigned value
  - A time value of DUID
  - A Link-layer address

  Step 10: The NUT transmits a properly formatted Advertise message with the same DUID values as transmitted in Step 6.
- *Part C*

  Step 13: The NUT transmits a properly formatted Advertise message containing the following DUID option values:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IANA value
  - A non-zero identifier number value of DUID
- *Part D*

  Step 16: The NUT transmits a properly formatted Advertise message containing the following DUID option values:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IANA value
  - A non-zero identifier number value of DUID

  Step 20: The NUT transmits a properly formatted Advertise message with the same DUID values as transmitted in Step 16.

- *Part E*

Step 23: The NUT transmits a properly formatted Advertise message containing the following DUID option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IANA-assigned value
- A Link-layer address of DUID

- *Part F*

Step 26: The NUT transmits a properly formatted Advertise message containing the following DUID option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IANA-assigned value
- A Link-layer address of DUID

Step 30: The NUT transmits a properly formatted Advertise message with the same DUID values as transmitted in Step 26.

Possible Problems:

- Either of the following tests is executed according to the DUID type of the server.

  - Server DUID type is DUID-LLT
    Part A and Part B
  - Server DUID type is DUID-EN
    Part C and Part D
  - Server DUID type is DUID-LL
    Part E and Part F

Test DHCP_CONF.2.1.7: Client Identifier Option

Purpose: To verify the format of the DHCPv6 Client Identifier option.

References:

- [DHCP 3315] – Section 22.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Client Identifier option values:

- An option-code set to OPTION_CLIENTID(1)
- An option-length set to the length of DUID in octets
- Same DUID value as in the Solicit message

Possible Problems:

- None.

Test DHCP_CONF.2.1.8: IA_NA Option Format

Purpose: To verify that the DHCPv6 Server transmits the correct IA_NA Option format.

References:

- [DHCP 3315] – Section 22.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_NA option.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following IA_NA option values:

- An option-code set to OPTION_IA_NA (3)
- An option-length set to 12 + length of IA_NA options field
- Same IAID value as in the Solicit message
- Time T1 set to a number
- Time T2 set to a number

Possible Problems:

- None.

Test DHCP_CONF.2.1.9: IA Address Option Format

Purpose: To verify that the DHCPv6 server transmits the correct IA Address Option format.

References:

- [DHCP 3315] – Section 22.6

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_NA option and an IA Address option.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following IA Address option values:

- An option-code set to OPTION_IA_NA (5)
- An option-length set to 24 + length of IAaddr-options field
- Any Valid IPv6 Address
- A preferred lifetime
- A valid lifetime

Possible Problems:

- None.

Test DHCP_CONF.2.1.10: Status Code Option Format

Purpose: To verify that the DHCP server transmits the correct Status Code Option format.

References:

- [DHCP 3315] – Section 18.2.1 and 22.13

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a solicit message on Link A.
3. After the reception of an Advertise message from NUT, TN1 transmits a Request message with inappropriate IP address for the Link in IA Address option.
4. Observe the messages transmitted on Link A.

Observable Results:

Steps 4: The NUT transmits a properly formatted Reply message containing the following Status Code option values:

- An option-code set to OPTION_STATUS_CODE (13)
- An option-length set to 2 + length of status-message
- A status-code set to NotOnLink (4)
- A status-message set to any

Possible Problems:

- None.

Test DHCP_CONF.2.1.11: Relay Message Option Format

Purpose: To verify that the DHCP server transmits the correct Relay Message Option format.

References:

- [DHCP 3315] – Section 22.10

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN5 transmits a Relay Forward Solicit message with a Relay Message option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following Relay Message option values:

- An option-code set to OPTION_RELAY_MSG(9)
- An option-length set to length of DHCP-relay-message
- A DHCP-relay-message containing Advertise message.

Possible Problems:

- None.

Test DHCP_CONF.2.1.12: Interface ID Option Format

Purpose: To verify that the DHCP server transmits the correct Interface ID Option format.

References:

- [DHCP 3315] – Section 22.18

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN5 transmits a Relay Forward Solicit message with an Interface ID option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay- reply advertise message that includes the same Interface ID option transmitted in the Relay-forward message (Step2). And the Interface ID option values:

- An option-code set to OPTION_INTERFACE_ID (18)
- An option-length set to length of interface-id
- A interface-id set to any

Possible Problems:

- None.

Group 2: Server Message Transmission

Scope

The following tests focus on the Server message creation, transmission and termination of DHCP IPv6 exchanges. Tests in this section are focused on server devices.

Test DHCP_CONF.2.2.1: Transmission of Advertise Messages

Purpose: To verify a server device transmits Advertise messages in response to Solicit messages.

References:

- [DHCP 3315] – Sections 17.2.2

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Advertise message transmission

1. TN1 transmits a valid Solicit message on Link A.
2. Observe the messages transmitted on Link A.

Part B: Advertise message in response to Solicit message with IA_NA Option

3. TN1 transmits a valid Solicit message with an IA_NA option on Link A.
4. Observe the messages transmitted on Link A.

Part C: Advertise message in response to Solicit message with Multiple IA_NA Options

5. TN1 transmits a valid Solicit message with two IA_NA options on Link A.
6. Observe the messages transmitted on Link A.

Part D: Advertise message transmission with Status Code Option, NoAddrAvail

7. Configure the NUT to only assign one address.
8. Common Test Setup 1.1 is performed on the Server device.
9. Observe the messages transmitted on Link A, while Step 8 is performed.
10. TN2 transmits a valid Solicit message with an IA_NA option on Link A.
11. Observe the messages transmitted on Link A.

Part E: Relay-Reply message with Advertise message (w/o Interface-id Option)

12. TN5 transmits a valid Relay-forward Solicit message on Link A.
13. Observe the messages transmitted on Link A.

Part F: Relay-Reply message with Advertise message (w/ Interface-id Option)

14. TN5 transmits a valid Relay-forward Solicit message with an Interface-id option on Link A.
15. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Advertise message containing the following elements:

  - Destination address set to TN1's unicast address same as the Solicit message's source address
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as the Solicit message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Solicit message's Client Identifier option
- *Part B*

Step 4: The NUT transmits a properly formatted Advertise message containing the following elements:

- Destination address set to TN1's unicast address same as the Solicit message's source address
- A msg-type field set to ADVERTISE (2)
- A transaction-id set to the same as Solicit message's transaction-id
- A Server Identifier option (containing a DUID)
- A Client Identifier option set to the same as Solicit message's Client Identifier option
- An IA NA option set to the following values:
  - An option-code set to OPTION_IA_NA (3)
  - An option-length set to 12 + length of IA_NA options field
  - An IAID value set to the same as Solicit message's IAID
  - Time T1 set to a number
  - Time T2 set to a number
- An IA Address option set to the following values:
  - An option-code set to OPTION_IAADDR (5)
  - An option-length set to 24 + length of IAaddr-options field
  - Any Valid IPv6 Address
  - A preferred lifetime
  - A valid lifetime

- *Part C*

  Step 6: The NUT transmits a properly formatted Advertise message containing the following elements:

  - Destination address set to TN1's unicast address same as the Solicit message's source address
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as Solicit message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Solicit message's Client Identifier option
  - Two IA_NA options

- *Part D*

  Step 9: The NUT transmits a properly formatted Advertise and Reply messages to TN1 where TN1 assigned an address to its interface.

  Step 11: The NUT transmits a properly formatted Advertise message with a Status Code option set to NoAddrsAvail(2) and a status message for the user, a Server Identifier option with the server's DUID, and a Client Identifier option with the client's DUID.

- *Part E*

  Step 13: The NUT transmits a properly formatted Relay-Reply message with Advertise message. The destination address is set to TN5's address.

- *Part F*

  Step 15: The NUT transmits a properly formatted Relay-Reply message with Advertise message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.

Possible Problems:

Test DHCP_CONF.2.2.2: Transmission of Reply Messages

Purpose: To verify a server device transmits proper Reply messages.

References:
- [DHCP 3315] – Sections 17.2.3 and 18.2

Test Setup: Connect the network according to the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Reply message transmission
1. TN1 transmits a valid Solicit message on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message on Link A.
3. Observe the messages transmitted on Link A.

Part B: Relay-Reply message with Reply message (w/o Interface-id Option)
4. TN5 transmits a valid Relay-forward Solicit message on Link A.
5. After the reception of a Relay-Reply Advertise message, TN5 transmits a valid Relay-forward Request message on Link A.
6. Observe the messages transmitted on Link A.

Part C: Relay-Reply message with Reply message (w/ Interface-id Option)
7. TN5 transmits a valid Relay-forward Solicit message with an Interface-id option on Link A.
8. After the reception of a Relay-Reply Advertise message with an Interface-id option, TN5 transmits a valid Relay-forward Request message with an Interface-id option on Link A.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT transmits a properly formatted Reply message containing the following elements:
  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY (7)
  - A transaction-id set to the same as Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - An IA NA option set to the following values:
    - An option-code set to OPTION_IA_NA (3)
    - An option-length set to 12 + length of IA_NA options field
    - An IAID value set to the same as Request message's IAID
    - Time T1 set to a number

- Time T2 set to a number
- An IA Address option set to the following values:
    - An option-code set to OPTION_IAADDR (5)
    - An option-length set to 24 + length of IAaddr-options field
    - Any Valid IPv6 Address
    - A preferred lifetime
    - A valid lifetime

- *Part B*

  Step 6: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address.
- *Part C*

  Step 9: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.

Possible Problems:

- None.

Test DHCP_CONF.2.2.3: Transmission of Relay-Reply messages

Purpose: To verify a server device transmits proper Relay-Reply messages.

References: [DHCP 3315] – Section 20.3

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-Reply message transmission

1. TN5 transmits a valid Relay-forward Solicit message on Link A.
2. Observe the messages transmitted on Link A.

Part B: Relay-Reply message transmission through the same Relay agents

3. TN5 transmits a Relay-forward Solicit message from TN3 on Link A.
4. Observe the messages transmitted on Link A.
5. TN6 transmits a Relay-forward Solicit message from TN3 on Link A.
6. Observe the messages transmitted on Link A.

Part C: Relay-Reply message transmission through the layered Relay agents

7. TN4 transmits a Solicit message on Link C. TN7 transmits a Relay-forward Solicit message from TN4 on Link B. TN5 transmits a valid Relay-forward Solicit message from TN7 on Link A.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following elements:
    - Destination address set to TN5's unicast address same as the Relay-forward message's source address
    - A msg-type field set to RELAY-REPL(13)
    - A hop-count set to the same as Relay-forward Solicit message's hop-count
    - A link-address set to the same as Relay-forward Solicit message's link-address
    - A peer-address set to the same as Relay-forward Solicit message's peer-address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Advertise message
        - An Advertise message containing the following elements:
            - A Server Identifier option (containing a DUID)
            - A Client Identifier option set to the same as Relay-forward Solicit message's Client Identifier option
            - A IA_NA option
- *Part B*

Step 4: The NUT transmits a Relay-Reply Advertise message to TN5.
Step 6: The NUT transmits a Relay-Reply Advertise message to TN6.

- *Part C*

  Step 8: The NUT transmits a properly formatted Reply-Reply Advertise message containing the following elements:

  - A msg-type set to RELAY-REPLY (13)
  - A hop-count set to 1
  - A link-address set to zero
  - A peer-address set to TN7's Global or Link Local Address on Link C.
  - A DHCP-relay-message set to a Relay Message Option:
    - A msg-type set to RELAY-REPLY (13)
    - A hop-count set to 0
    - A link-address set to TN7's Global Address on Link D.
    - Peer-address set to TN4's Link Local Address
    - A DHCP-relay-message set to an Advertise message

Possible Problems:

- None.

Group 3: Message Reception

Scope:

The following tests focus on the server's implementation of DHCPv6 and the reception of valid and invalid DHCPv6 messages by a client device.

Test DHCP_CONF.2.3.1 Reception of Solicit messages

Purpose: To verify a server device properly handles the reception of Solicit messages.

References:

- [DHCP 3315] – Section 9, 15 and 17. 2. 1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Solicit message via unicast

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with unicast destination address to the NUT.
3. Observe the messages transmitted on Link A.

Part B: Reception of Solicit message with DUID-LLT

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message using DUID-LLT.
6. Observe the messages transmitted on Link A.

Part C: Reception of Solicit message with DUID-EN

7. Enable DHCPv6 on the NUT.
8. TN1 transmits a Solicit message using DUID-EN.
9. Observe the messages transmitted on Link A.

Part D: Reception of Solicit message with DUID-LL

10. Enable DHCPv6 on the NUT.
11. TN1 transmits a Solicit message using DUID-LL.
12. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

Step 3: The NUT must not transmit any Advertise message in the response to the Solicit message.

- *Part B*

Step 6: The NUT transmits Advertise message with Client ID option same as the Solicit message.

- *Part C*

Step 9: The NUT transmits Advertise message with Client ID option same as the Solicit message.

- *Part D*

Step 12: The NUT transmits Advertise message with Client ID option same as the Solicit message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.2 Reception of Request messages

Purpose: To verify a server device properly handles the reception of Request messages.

References:

- [DHCP 3315] – Section 18.2.1

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Request message via unicast

1. TN1 transmits a valid Solicit message on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a Request message with unicast destination address to NUT.
3. Observe the messages transmitted on Link A.

Part B: Reception of Request message with inappropriate address for link

4. TN1 transmits a valid Solicit message with an IA_NA option on Link A.
5. After the reception of an Advertise message from the NUT, TN1 transmits a Request message with inappropriate address for Link A in IA_NA option on Link A.
6. Observe the messages transmitted on Link A.

Part C: Reception of Request message if NUT cannot assign any addresses

7. Configure the NUT to only assign one address.
8. Common Test Setup 1.1 is performed on the Server device.
9. Observe the messages transmitted on Link A, while Step 8 is performed.
10. TN2 transmits a valid Solicit message with an IA_NA option on Link A.
11. After the reception of an Advertise message from the NUT, TN2 transmits a Request message with an IA_NA option on Link A.
12. Observe the messages transmitted on Link A.

Part D: Reception of twice Request messages

13. TN1 transmits a valid Solicit message an IA_NA option on Link A.
14. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with IA_NA option on Link A.
15. Observe the messages transmitted on Link A.
16. After the reception of an Reply message from the NUT, TN1 transmits a valid Request message with IA_NA option on Link A.
17. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.

- *Part B*

Step 6: The NUT transmits a Reply message containing a Status Code option with the value NotOnLink, a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option.

- *Part C*

  Step 12: The NUT transmits a Reply message containing a Status Code option with the value NoAddrsAvail in the IA, a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option with no address.

- *Part D*

  Step 15: The NUT transmits a valid Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option.

  Step 17: The NUT transmits a valid Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option that same as Step 15's IA_NA option.

Possible Problems:

- None.

Test DHCP_CONF.2.3.3 Reception of Confirm messages

Purpose: To verify a server device properly handles the reception of Confirm messages.

References:
- [DHCP 3315] – Section 15 and 18.2.2

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Confirm message via unicast
1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Confirm message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Confirm message

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a valid Confirm message including an IA_NA option and IA Address option on Link A.
6. Observe the messages transmitted on Link A

Part C: Reception of Confirm message with invalid addresses

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Confirm message including an IA_NA option and IA Address option with invalid prefix on Link A.
9. Observe the messages transmitted on Link A.

Part D: Reception of Confirm message with no addresses

10. Common Test Setup 1.1 is performed on the Server device.
11. TN1 transmits a Confirm message including an IA_NA option without IA Address option on Link A.
12. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must not transmit any Reply message in the response to the Confirm message.
- *Part B*

  Step 6: The NUT transmits a Reply message containing a Status Code option with the value Success(or without a Satus Code option), a Server Identifier option, the Client Identifier option from the TN1 message.
- *Part C*

  Step 9: The NUT transmits a Reply message containing a Status Code option with the value NotOnLink, a Server Identifier option, the Client Identifier option from the TN1 message.
- *Part D*

Step 12: The NUT must not transmit any Reply message in the response to the Confirm message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.4 Reception of Renew messages

Purpose: To verify a server device properly handles the reception of Renew messages.

References:

- [DHCP 3315] – Section 18.2.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Renew message via unicast

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Renew message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Renew message

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a valid Renew message including an IA_NA option and IA Address option on Link A.
6. Observe the messages transmitted on Link A

Part C: Reception of Renew message with invalid addresses

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Renew message including an IA_NA option with valid Identifier and IA Address option with inappropriate address on Link A.
9. Observe the messages transmitted on Link A.

Part D: Reception of Renew message with invalid IA_NA Identifier

10. Common Test Setup 1.1 is performed on the Server device.
11. TN1 transmits a Renew message including an IA_NA option with invalid Identifier and IA Address option.
12. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option with IA Address option.
- *Part C*

Step 9: The NUT transmits a Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option with IA Address option with PreferredLifetime and ValidLifetime set to 0.

- *Part D*

  Step 12: The NUT transmits a Reply message containing a Status Code option with the value NoBinding, a Server Identifier option, the Client Identifier option from the TN1 message, and not include any IA Address options.

Possible Problems:

- None.

Test DHCP_CONF.2.3.5 Reception of Rebind messages

Purpose: To verify a server device properly handles the reception of Rebind messages.

References:

- [DHCP 3315] – Section 15 and 18.2.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Rebind message via unicast

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Rebind message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Rebind message

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a valid Rebind message including an IA_NA option and IA Address option on Link A.
6. Observe the messages transmitted on Link A

Part C: Reception of Rebind message with invalid IA_NA Identifier and invalid addresses

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Rebind message including an IA_NA option with invalid Identifier and IA Address option with inappropriate address on Link A.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must not transmit any Reply message in the response to the Rebind message.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option with IA Address option.
- *Part C*

  Step 9: The NUT must not transmit any Reply message in the response to the Rebind message or the NUT transmits a Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option with IA Address option with PreferredLifetime and ValidLifetime set to 0.

Possible Problems:

- None.

Test DHCP_CONF.2.3.6 Reception of Release messages

Purpose: To verify a server device properly handles the reception of Release messages.

References:
- [DHCP 3315] – Section 18.2.6

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Release message via unicast

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Release message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Release message

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a valid Release message including an IA_NA option and IA Address option on Link A.
6. Observe the messages transmitted on Link A

Part C: Reception of Release message with invalid IA_NA Identifier

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Release message including two IA_NA options with invalid Identifier and IA Address option.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a Status Code option with the value Success (or without a Satus Code option), a Server Identifier option and the Client Identifier option from the TN1 message.
- *Part C*

  Step 9: The NUT transmits a Reply message containing a Status Code option with the value NoBinding in the each IA_NA option(No other options are included in the IA_NA option), a Server Identifier option, the Client Identifier option from the TN1 message, and a Status Code option with the value Success.

Possible Problems:

- None.

Test DHCP_CONF.2.3.7 Reception of Decline messages

Purpose: To verify a server device properly handles the reception of Decline messages.

References:

- [DHCP 3315] – Section 18.2.7

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Decline message via unicast

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Decline message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Decline message

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a valid Decline message including an IA_NA option and IA Address option on Link A.
6. Observe the messages transmitted on Link A

Part C: Reception of Decline message with invalid IA_NA Identifier

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Decline message including two IA_NA options with invalid Identifier and IA Address option.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a Status Code option with the value Success(or without a Satus Code option), a Server Identifier option and the Client Identifier option from the TN1 message.
- *Part C*

  Step 9: The NUT transmits a Reply message containing a Status Code option with the value NoBinding in the each IA_NA option(No other options are included in the IA_NA option), a Server Identifier option, the Client Identifier option from the TN1 message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.8: Reception of Invalid Solicit message

Purpose: To verify a server device properly handles the reception of invalid Solicit messages.

References:

- [DHCP 3315] – Sections 15 and 15.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Contains Server Identifier option

1. TN1 transmits a Solicit message that contains a Server Identifier option.
2. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

3. TN1 transmits a Solicit message that does not contain a Client Identifier option.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the Solicit message. The NUT must not send an Advertise message based on the received Solicit message.
- *Part B*

  Step 4: The NUT must silently discard the Solicit message. The NUT must not send an Advertise message based on the received Solicit message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.9: Reception of Invalid Request message

Purpose: To verify a server device properly handles the reception of invalid Request messages.

References:

- [DHCP 3315] – Sections 15 and 15.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. TN1 transmits a valid Solicit message on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a Request message that does not contain a Server Identifier option.
3. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

4. TN1 transmits a valid Solicit message on Link A.
5. After the reception of an Advertise message from the NUT, TN1 transmits a Request message that does not contain a Client Identifier option.
6. Observe the messages transmitted on Link A.

Part C: Server Identifier that does not match the DUID of the server

7. TN1 transmits a valid Solicit message on Link A.
8. After the reception of an Advertise message from the NUT, TN1 transmits a properly formatted Request message. The Request message contains a Server Identifier option whose value does not match the server's DUID.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.
- *Part B*

  Step 6: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.
- *Part C*

  Step 9: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.10: Reception of Invalid Confirm message

Purpose: To verify a server device properly handles the reception of invalid Confirm messages.

References:

- [DHCP 3315] – Sections 15 and 15.5

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Contains Server Identifier option

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Confirm message including an IA_NA option with an IA Address option and a Server Identifier option.
3. Observe the messages transmitted on Link A

Part B: No Client Identifier option

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a Confirm message including an IA_NA option with an IA Address option and without a Client Identifier option.
6. Observe the messages transmitted on Link A

Observable Results:

- *Part A*

  Step 3: The NUT must silently discard the Confirm message. The NUT must not send a Reply message based on the received Confirm message.
- *Part B*

  Step 6: The NUT must silently discard the Confirm message. The NUT must not send a Reply message based on the received Confirm message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.11: Reception of Invalid Renew message

Purpose: To verify a server device properly handles the reception of invalid Renew messages.

References:

- [DHCP 3315] – Sections 15 and 15.6

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Renew message including an IA_NA option with an IA Address option and without a Server Identifier option.
3. Observe the messages transmitted on Link A

Part B: No Client Identifier option

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a Renew message including an IA_NA option with an IA Address option and without a Client Identifier option.
6. Observe the messages transmitted on Link A

Part C: Server Identifier that does not match the DUID of the server

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Renew message including an IA_NA option with an IA Address option and a Sever Identifier option whose value does not match the server's DUID.
9. Observe the messages transmitted on Link A

Observable Results:

- *Part A*

  Step 3: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.
- *Part B*

  Step 6: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.
- *Part C*

  Step 9: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.12: Reception of Invalid Rebind message

Purpose: To verify a server device properly handles the reception of invalid Rebind messages.

References:

- [DHCP 3315] – Sections 15 and 15.7

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Contains Server Identifier option

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Rebind message including an IA_NA option with an IA Address option and a Server Identifier option.
3. Observe the messages transmitted on Link A

Part B: No Client Identifier option

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a Rebind message including an IA_NA option with an IA Address option and without a Client Identifier option.
6. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 3: The NUT must silently discard the Rebind message. The NUT must not send a Reply message based on the received Rebind message.
- *Part B*
  Step 6: The NUT must silently discard the Rebind message. The NUT must not send a Reply message based on the received Rebind message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.13: Reception of Invalid Release message

Purpose: To verify a server device properly handles the reception of invalid Release messages.

References:

- [DHCP 3315] – Sections 15 and 15.9

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Release message including an IA_NA option with an IA Address option and without a Server Identifier option.
3. Observe the messages transmitted on Link A

Part B: No Client Identifier option

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a Release message including an IA_NA option with an IA Address option and without a Client Identifier option.
6. Observe the messages transmitted on Link A

Part C: Server Identifier that does not match the DUID of the server

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Release message including an IA_NA option with an IA Address option and a Sever Identifier option whose value does not match the server's DUID.
9. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 3: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.
- *Part B*
  Step 6: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.
- *Part C*
  Step 9: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.14: Reception of Invalid Decline message

Purpose: To verify a server device properly handles the reception of invalid Decline messages.

References:
- [DHCP 3315] – Sections 15 and 15.8

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. Common Test Setup 1.1 is performed on the Server device.
2. TN1 transmits a Decline message including an IA_NA option with an IA Address option and without a Server Identifier option.
3. Observe the messages transmitted on Link A

Part B: No Client Identifier option

4. Common Test Setup 1.1 is performed on the Server device.
5. TN1 transmits a Decline message including an IA_NA option with an IA Address option and without a Client Identifier option.
6. Observe the messages transmitted on Link A

Part C: Server Identifier that does not match the DUID of the server

7. Common Test Setup 1.1 is performed on the Server device.
8. TN1 transmits a Decline message including an IA_NA option with an IA Address option and a Sever Identifier option whose value does not match the server's DUID.
9. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 3: The NUT must silently discard the Decline message. The NUT must not send a Reply message based on the received Decline message.
- *Part B*
  Step 6: The NUT must silently discard the Decline message. The NUT must not send a Reply message based on the received Decline message.
- *Part C*
  Step 9: The NUT must silently discard the Decline message. The NUT must not send a Reply message based on the received Decline message.

Possible Problems:

- None.

Test DHCP_CONF.2.3.15: Server Message Validation

Purpose: To verify a server device properly discards all Advertise, Reply and Relay-reply messages.

References:

- [DHCP 3315] – Sections 15.3, 15.10 and 15.14

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Advertise message (type 2)

1. TN1 transmits an Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
2. Observe the messages transmitted on Link A.

Part B: Reply message (type 7)

3. TN1 transmits an Reply message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
4. Observe the messages transmitted on Link A.

Part C: Relay-reply message (type 13)

5. TN1 transmits a Relay Reply Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT discards the Advertise message from TN1 and does not transmit any packets.
- *Part B*

  Step 4: The NUT discards the Reply message from TN1 and does not transmit any packets.
- *Part D*

  Step 6: The NUT discards the Relay Reply message from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 3: RFC 3315 - Relay Agent Specification

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3315.
These tests verify the process for relaying specific messages regarding Address Assignment.

Overview

These tests are designed to verify the readiness of a DHCPv6 Relay agent implementation vis-à-vis base specifications of the Dynamic Host Configuration Protocol for IPv6.

Test DHCP_CONF.3.1.1: Basic Message Exchanges

Purpose: To verify a DHCPv6 relay agent device properly handles the reception of DHCPv6 messages during a basic message exchange.

References:

- [DHCP 3315] – Section 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Valid Advertise message in response to Solicit and valid Reply message in response to Request.

1. Common Test Setup 1.1 is performed for Relay agent device.
2. Observe the messages transmitted on Link A and Link B, while Step1 is performed.

Part B: Valid Reply message in response to Confirm message

3. Common Test Setup 1.1 is performed for Relay agent device.
4. TN1 transmits a valid Confirm message with an IA_NA and IA Address Option on Link B.
5. Observe the messages transmitted on Link A.
6. Upon the reception of a Relay-forward Confirm message from the NUT, TN2 transmits a valid Relay-reply Reply message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Valid Reply message in response to a Renew message.

8. Common Test Setup 1.1 is performed for Relay agent device.
9. TN1 transmits a valid Renew message with an IA_NA and IA Address Option to the NUT.
10. Observe the messages transmitted on Link A.
11. Upon the reception of a Relay-forward Renew message from the NUT, TN2 transmits a valid Relay-reply Reply message to the NUT.
12. Observe the messages transmitted on Link B.

Part D: Valid Reply message in response to a Rebind message.

13. Common Test Setup 1.1 is performed for Relay agent device.
14. TN1 transmits a valid Rebind message with an IA_NA and IA Address Option to the NUT.
15. Observe the messages transmitted on Link A.
16. Upon the reception of a Relay-forward Rebind message from the NUT, TN2 transmits a valid Relay-reply Reply message to the NUT.
17. Observe the messages transmitted on Link B.

Part E: Valid Reply message in response to a Release message.

18. Common Test Setup 1.1 is performed for Relay agent device.
19. TN1 transmits a valid Release message with an IA_NA and IA Address Option to the NUT.
20. Observe the messages transmitted on Link A.
21. Upon the reception of a Relay-forward Release message from the NUT, TN2 transmits a valid Relay-reply Reply message to the NUT.
22. Observe the messages transmitted on Link B.

Part F: Valid Reply message in response to a Decline message.

23. Common Test Setup 1.1 is performed for Relay agent device.

24. TN1 transmits a valid Decline message with an IA_NA and IA Address Option to the NUT.
25. Observe the messages transmitted on Link A.
26. Upon the reception of a Relay-forward Decline message from the NUT, TN2 transmits a valid Relay-reply Reply message to the NUT.
27. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 2: The NUT transmitted a Relay-forward Solicit message in relaying of the Solicit message from TN1 to TN2 and the NUT transmitted an Advertise message in relaying of the Relay-reply Advertise message from TN2 to TN1. The NUT transmitted a Relay-forward Request message in relaying of the Request message from TN1 to TN2 and the NUT transmitted a Reply message in relaying of the Relay-reply Reply message from TN2 to TN1.
- *Part B*

  Step 5: The NUT transmitted a Relay-forward Confirm message in relaying of the Confirm message.

  Step 7: The NUT transmitted a Reply message in relaying of the Relay-reply Reply message.
- *Part C*

  Step 10: The NUT transmitted a Relay-forward Renew message in relaying of the Renew message.

  Step 12: The NUT transmitted a Reply message in relaying of the Relay-reply Reply message.
- *Part D*

  Step 15: The NUT transmitted a Relay-forward Rebind message in relaying of the Renew message.

  Step 17: The NUT transmitted a Reply message in relaying of the Relay-reply Reply message.
- *Part E*

  Step 20: The NUT transmitted a Relay-forward Release message in relaying of the Renew message.

  Step 22: The NUT transmitted a Reply message in relaying of the Relay-reply Reply message.
- *Part F*

  Step 25: The NUT transmitted a Relay-forward Decline message in relaying of the Renew message.

  Step 27: The NUT transmitted a Reply message in relaying of the Relay-reply Reply message.

Possible Problems:

- None.

Test DHCP_CONF.3.1.2: Implementation of DHCP constants

Purpose: To verify that the Relay agent listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.1, 5.2 and 20
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

Part A: Multicast Address and Hop Limit

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Valid UDP port

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message to UDP destination port 547.
6. Observe the messages transmitted on Link A.
7. Upon reception of a Relay-forward Solicit message from the NUT, TN2 transmits a Relay-reply Advertise message to UDP port 547.
8. Observe the messages transmitted on Link B.

Part C: Invalid UDP port

9. Enable DHCPv6 on the NUT.
10. TN1 transmits a Solicit message to UDP destination port 33536.
11. Observe the messages transmitted on Link A and B.

Observable Results:

- *Part A*

  Step 2: The NUT must transmit a Relay-forward Solicit message with a destination address set to the "ALL_DHCP_Servers" multicast address (FF05::1:3) and a Hop Limit set to 32.
- *Part B*

  Step 5: The NUT must transmit a Relay-forward Solicit message with a destination UDP port set to 547.

  Step 7: The NUT must process the correct Relay-reply Advertise message and transmit an Advertise message to TN1.
- *Part C*

  Step 10: The NUT should silently ignore the Solicit message from TN and does not send any DHCPv6 messages.

Possible Problems:

- None.

Test DHCP_CONF.3.1.3: Relay Agent Message Format

Purpose: To verify that the Relay agent transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 7, 7.1 and 7.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message on Link B.
3. Observe the messages on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-forward message containing the following elements:

- The msg-type field was set to the value of 12(Relay-forward)
- Hop-count field was set to 0
- Link-address field was set to the address of Relay agent interface for Link A
- Peer-address (Copied from the Solicit message)
- A Relay Message Option

Possible Problems:

- None.

Test DHCP_CONF.3.1.4: Relay Message Option Format

Purpose: To verify that the DHCP relay agent transmits the correct Relay Message Option format.

References:
- [DHCP 3315] – Section 22.10

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message on Link B
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-forward Solicit message containing the following Relay Message option values:
- An option-code set to OPTION_RELAY_MSG(9)
- An option-length set to length of DHCP-relay-message
- A DHCP-relay-message containing Solicit message.

Possible Problems:

- None.

Test DHCP_CONF.3.1.5: Relay and Transmission of Advertise Messages

Purpose: To verify a relay agent device relays and transmits Advertise messages.

References:

- [DHCP 3315] – Sections 20.2 and 20.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Advertise message transmission

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. Observe the messages transmitted on Link B.

Part B: Relay-Reply Advertise message transmission through the layered Relay agents

5. Enable DHCPv6 on the NUT.
6. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
7. TN4 transmits a valid Relay-forward Solicit message to the NUT.
8. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
9. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Advertise message containing the following elements:
    - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Advertise message
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
    - A Server Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
    - A Client Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
    - An IA_NA option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
- *Part B*

  Step 9: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following elements:

- Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Advertise message from TN2
- A msg-type field set to RELAY-REPL(13)
- A hop-count set to 0
- A link-address set to the same as Relay-Reply Advertise message's link-address in Relay Message option
- A peer-address set to the same as Relay-Reply Advertise message's peer-address in Relay Message option
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Advertise message
    - An Advertise message containing the following elements:
        - A transaction-id set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
        - A Server Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
        - A Client Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
        - An IA_NA option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2

Possible Problems:

- None.

Test DHCP_CONF.3.1.6: Relay and Transmission of Reply Messages

Purpose: To verify a relay agent device relays and transmits Reply messages.

References:

- [DHCP 3315] – Sections 20.2 and 20.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Reply message transmission

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option on Link B.
5. After the reception of a Relay-forward Request message from the NUT on Link B, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
6. Observe the messages transmitted on Link A.

Part B: Relay-Reply Reply message transmission through the layered Relay agents

7. Enable DHCPv6 on the NUT.
8. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
9. TN4 transmits a valid Relay-forward Solicit message to the NUT.
10. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
11. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
12. TN3 transmit a valid Request message including an IA_NA option on Link C.
13. TN4 transmits a valid Relay-forward Request message to the NUT.
14. After the reception of a Relay-forward Request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
15. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 6: The NUT transmits a properly formatted Reply message containing the following elements:

  - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Reply message
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message

- A Server Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
- A Client Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
- An IA_NA option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message

- *Part B*

  Step 15: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:

  - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Reply message from TN2
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to 0
  - A link-address set to the same as Relay-Reply Reply message's link-address in Relay Message option
  - A peer-address set to the same as Relay-Reply Reply message's peer-address in Relay Message option
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Reply message
    - A Reply message containing the following elements:
      - A transaction-id set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - A Server Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - A Client Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - An IA_NA option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2

Possible Problems:

- None.

Test DHCP_CONF.3.1.7: Relay and Transmission of Relay-forward Solicit Messages

Purpose: To verify a relay agent device relays and transmits Solicit messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Solicit message transmission

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Solicit message transmission through the layered Relay agents (w/o Interface-ID Option)

4. Enable DHCPv6 on the NUT.
5. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
6. TN4 transmits a valid Relay-forward Solicit message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Solicit message transmission through the layered Relay agents (w Interface-ID Option)

8. Enable DHCPv6 on the NUT.
9. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
10. TN4 transmits a valid Relay-forward Solicit message to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:

  - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
  - A peer-address set to the same as the Solicit message’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Solicit message
    - A Solicit message containing the following elements:

- A meg-type set to the value of 1 (Solicit)
- A transaction-id set to the same as the Solicit message's transaction-id
- A Client Identifier option set to the same as the Solicit message's Client Identifier option
- An IA_NA option set to the same as the Solicit message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Solicit message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Solicit message

- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Solicit message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Solicit message

Possible Problems:

- None.

Test DHCP_CONF.3.1.8: Relay and Transmission of Relay-forward Request Messages

Purpose: To verify a relay agent device relays and transmits Request messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Request message transmission

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option on Link B.
5. Observe the messages transmitted on Link A.

Part B: Relay-forward Request message transmission through the layered Relay agents(w/o Interface-ID Option)

6. Enable DHCPv6 on the NUT.
7. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
8. TN4 transmits a valid Relay-forward Solicit message to the NUT.
9. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
10. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
11. TN3 transmit a valid Request message including an IA_NA option on Link C.
12. TN4 transmits a valid Relay-forward Request message to the NUT.
13. Observe the messages transmitted on Link A.

Part C: Relay-forward Request message transmission through the layered Relay agents(w Interface-ID Option)

14. Enable DHCPv6 on the NUT.
15. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
16. TN4 transmits a valid Relay-forward Solicit message to the NUT.
17. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
18. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
19. TN3 transmit a valid Request message including an IA_NA option on Link C.
20. TN4 transmits a valid Relay-forward Request message to the NUT.
21. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
  - A peer-address set to the same as the Request message’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Request message
    - A Request message containing the following elements:
      - A meg-type set to the value of 3 (Request)
      - A transaction-id set to the same as the Request message’s transaction-id
      - A Client Identifier option set to the same as the Request message’s Client Identifier option
      - A Server Identifier option set to the same as the Request message’s Server Identifier option
      - An IA_NA option set to the same as the Request message’s one
- *Part B*

  Step 13: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT’s global address on Link B)
  - A peer-address set to the same as the Relay-forward Request message(Step17)’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Request message
- *Part C*

  Step 21: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option

- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Request message(Step17)'s source address
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Request message

Possible Problems:

- None.

Test DHCP_CONF.3.1.9: Relay and Transmission of Relay-forward Confirm Messages

Purpose: To verify a relay agent device relays and transmits Confirm messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Confirm message transmission

1. Common Test Setup 1.1 is performed for Address Assignment for Relay agent device.
2. TN1 transmits a valid Confirm message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Confirm message transmission through the layered Relay agents(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
5. TN3 transmits a valid Confirm message on Link C.
6. TN4 transmits a valid Relay-forward Confirm message to the NUT.
7. Observe the messages transmitted on Link B.

Part C: Relay-forward Confirm message transmission through the layered Relay agents(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
9. TN3 transmits a valid Confirm message on Link C.
10. TN4 transmits a valid Relay-forward Confirm message to the NUT.
11. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Confirm message containing the following elements:
    - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
    - A msg-type field set to RELAY-FORW(12)
    - A hop-count set to 0
    - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
    - A peer-address set to the same as the Confirm message’s source address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Confirm message
        - A Confirm message containing the following elements:

- A meg-type set to the value of 4 (Confirm)
- A transaction-id set to the same as the Confirm message's transaction-id
- A Client Identifier option set to the same as the Confirm message's Client Identifier option
- An IA_NA option set to the same as the Confirm message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Confirm message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Confirm message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Confirm message
- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Confirm message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Confirm message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Confirm message

Possible Problems:

- None.

Test DHCP_CONF.3.1.10: Relay and Transmission of Relay-forward Renew Messages

Purpose: To verify a relay agent device relays and transmits Renew messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Renew message transmission

1. Common Test Setup 1.1 is performed for Address Assignment for Relay agent device.
2. TN1 transmits a valid Renew message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Renew message transmission through the layered Relay agents(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
5. TN3 transmits a valid Renew message on Link C.
6. TN4 transmits a valid Relay-forward Renew message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Renew message transmission through the layered Relay agents(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
9. TN3 transmits a valid Renew message on Link C.
10. TN4 transmits a valid Relay-forward Renew message to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to “ALL_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
  - A peer-address set to the same as the Renew message’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Renew message
    - A Renew message containing the following elements:

- A meg-type set to the value of 5 (Renew)
- A transaction-id set to the same as the Renew message's transaction-id
- A Client Identifier option set to the same as the Renew message's Client Identifier option
- A Server Identifier option set to the same as the Renew message's Server Identifier option
- An IA_NA option set to the same as the Renew message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Renew message
- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "ALL_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Renew message

Possible Problems:

- None.

Test DHCP_CONF.3.1.11: Relay and Transmission of Relay-forward Rebind Messages

Purpose: To verify a relay agent device relays and transmits Rebind messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Rebind message transmission

1. Common Test Setup 1.1 is performed for Address Assignment for Relay agent device.
2. TN1 transmits a valid Rebind message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Rebind message transmission through the layered Relay agents(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
5. TN3 transmits a valid Rebind message on Link B.
6. TN4 transmits a valid Relay-forward Rebind message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Rebind message transmission through the layered Relay agents(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
9. TN3 transmits a valid Rebind message on Link B.
10. TN4 transmits a valid Relay-forward Rebind message to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:

  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Rebind message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Rebind message
    - A Rebind message containing the following elements:

- A meg-type set to the value of 6 (Rebind)
- A transaction-id set to the same as the Rebind message's transaction-id
- A Client Identifier option set to the same as the Rebind message's Client Identifier option
- An IA_NA option set to the same as the Rebind message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Rebind message
- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Rebind message

Possible Problems:

- None.

Test DHCP_CONF.3.1.12: Relay and Transmission of Relay-forward Release Messages

Purpose: To verify a relay agent device relays and transmits Release messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Release message transmission

1. Common Test Setup 1.1 is performed for Address Assignment for Relay agent device.
2. TN1 transmits a valid Release message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Release message transmission through the layered Relay agents(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
5. TN3 transmits a valid Release message on Link B.
6. TN4 transmits a valid Relay-forward Release message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Release message transmission through the layered Relay agents(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
9. TN3 transmits a valid Release message on Link B.
10. TN4 transmits a valid Relay-forward Release message to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Release message containing the following elements:

  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Release message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Release message
    - A Release message containing the following elements:

- A meg-type set to the value of 8 (Release)
- A transaction-id set to the same as the Release message's transaction-id
- A Client Identifier option set to the same as the Release message's Client Identifier option
- A Server Identifier option set to the same as the Release message's Server Identifier option
- An IA_NA option set to the same as the Release message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Release message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Release message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Release message
- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Release message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Release message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Release message

Possible Problems:

- None.

Test DHCP_CONF.3.1.13: Relay and Transmission of Relay-forward Decline Messages

Purpose: To verify a relay agent device relays and transmits Decline messages.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Decline message transmission

1. Common Test Setup 1.1 is performed for Address Assignment for Relay agent device.
2. TN1 transmits a valid Decline message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Decline message transmission through the layered Relay agents(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
5. TN3 transmits a valid Decline message on Link B.
6. TN4 transmits a valid Relay-forward Decline message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Decline message transmission through the layered Relay agents(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment for Relay agent device.
9. TN3 transmits a valid Decline message on Link B.
10. TN4 transmits a valid Relay-forward Decline message to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Decline message containing the following elements:
  - Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
  - A peer-address set to the same as the Decline message’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Decline message
    - A Decline message containing the following elements:

- A meg-type set to the value of 9 (DECLINE)
- A transaction-id set to the same as the Decline message's transaction-id
- A Client Identifier option set to the same as the Decline message's Client Identifier option
- A Server Identifier option set to the same as the Decline message's Server Identifier option
- An IA_NA option set to the same as the Decline message's one

- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Decline message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Decline message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Decline message
- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Decline message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Decline message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Decline message

Possible Problems:

- None.

Test DHCP_CONF.3.1.14: Reception of Invalid Relay-forward Messages

Purpose: To verify a relay agent device properly handles the reception of invalid Relay-forward messages.

References:

- [DHCP 3315] – Sections 20.1.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN3 transmits a valid Solicit message including an IA_NA option on Link C.
3. TN4 transmits a Relay-forward Solicit message which hop-count set to HOP_COUNT_LIMIT (32) to the NUT.
4. Observe the messages transmitted on Link A.

Observable Results:

Step 4: The NUT must silently discard the Relay-forward Solicit message. The NUT must not send a Relay-forward message based on the received Relay-forward Solicit message.

Possible Problems:

- None.

Test DHCP_CONF.3.1.15: Relay Agent Message Validation

Purpose: To verify a relay agent device properly discards all Advertise and Reply messages.

References:

- [DHCP 3315] – Sections 15.3 and 15.10.

Test Setup: Connect the network as described in the Common Topology. DHCPv6 on the relay agent device is disabled after each part.

Procedure:

Part A: Advertise message (type 2)

1. TN2 transmits an Advertise message to the NUT port 547.
2. Observe the messages transmitted on Link A and B.

Part B: Reply message (type 7)

3. TN2 transmits a Reply message to the NUT port 547.
4. Observe the messages transmitted on Link A and B.

Observable Results:

- *Part A*
  Step 2: The NUT discards the Advertise message from TN1 and does not transmit any packets.
- *Part B*
  Step 4: The NUT discards the Reply message from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 4: RFC 3646 - Client Specification

Scope

The following tests cover specifications for the client implementation of the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3646.
These tests verify the process for receiving a list of available DNS recursive name servers and a domain search list from a server in parallel with Address Assignment.

Overview

These tests are designed to verify the readiness of a DHCPv6 client implementation vis-à-vis the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 specification (Other configuration information function concurrently processing Address Assignment).

Test DHCP_CONF.4.1.1: Option Request Option Format

Purpose: To verify that the DHCP client transmits the correct Option Request Option format.

References:

- [DHCP 3315] – Section 17.1.1 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Option Request Option Format (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Option Request Option Format (Domain Search List option)

3. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to DNS Recursive Name Server Option (23)
- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to Domain Search List option (24)

Possible Problems:

- None.

Test DHCP_CONF.4.1.2: Transmission of Solicit Messages for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Solicit messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 17.1, 17.1.1 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 on the client device is disabled after each part.

Procedure:

Part A: Solicit message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Observe the Solicit message transmitted on Link A.

Part B: Solicit message format with Option Request Option (Domain Search List option)

3. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
4. Observe the Solicit message transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing an IA_NA option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing an IA_NA option and an Option Request option (Domain Search List option).

Possible Problems:

Test DHCP_CONF.4.1.3: Transmission of Request messages for DNS Configuration options

Purpose: To verify that a client device transmits properly formatted Request messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.1 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Request message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Observe the messages transmitted on Link A.

Part B: Request message format with Option Request Option (Domain Search List option)

4. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
5. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Request message containing an IA_NA option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 6: The NUT transmits a properly formatted Request message containing an IA_NA option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.4.1.4: Transmission of Confirm messages for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Confirm messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.2 and 22.7
- [DHCP 3646] – Section 3, 4 and 5

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Confirm message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
4. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
5. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
6. Observe the messages transmitted on Link A.

Part B: Confirm message format with Option Request Option (Domain Search List option)

7. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
8. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
9. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
10. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
11. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
12. Observe the messages transmitted on Link A.

Part C: Option Request Option status after confirm message without any reply (DNS Recursive Name Server option)

13. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.

14. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
15. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message including a DNS Recursive Name Server option that includes TN3 (DNS Server)'s global IPv6 address.
16. Configure NUT transmit an Echo request to "dhcpv6.test.example.com".
17. Observe the messages transmitted on Link A.
18. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
19. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), physically disconnect the TN1 interface on Link A, reconnect the NUT to Link A.
20. Configure NUT transmit an Echo request to "dhcpv6.test.example.com".
21. Observe the messages transmitted on Link A.

Part D: Option Request Option status after confirm message without any reply (DNS Recursive Name Server option)

22. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option and a Domain Search List option in parallel with Address Assignment on the NUT.
23. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
24. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message including a DNS Recursive Name Server option that includes TN3 (DNS Server)'s global IPv6 address and a Domain Search List option that includes "test.example.com".
25. Configure NUT transmit an Echo request to "dhcpv6".
26. Observe the messages transmitted on Link A.
27. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
28. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), physically disconnect the TN1 interface on Link A, reconnect the NUT to Link A.
29. Configure NUT transmit an Echo request to "dhcpv6".
30. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 6: The NUT transmits a properly formatted Confirm message containing an IA_NA option and the Confirm message must not contain a DNS Recursive Name Server option.
- *Part B*
  Step 12: The NUT transmits a properly formatted Confirm message containing an IA_NA option and the Confirm message must not contain a Domain Search List option.
- *Part C*
  Step 17: The NUT transmitted a DNS Standard Query to TN3.
  Step 21: The NUT transmitted a DNS Standard Query to TN3.

- *Part D*
  Step 26: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.

Step 30: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.

Possible Problems:

- None.

Test DHCP_CONF.4.1.5: Transmission of Renew messages for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Renew messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.3 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Renew message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message (TN1 sets T1 to 50s and T2 to 80s).
4. After time T1 observe the messages transmitted Link A.

Part B: Renew message format with Option Request Option (Domain Search List option).

5. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
6. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
7. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message (TN1 sets T1 to 50s and T2 to 80s).
8. After time T1 observe the messages transmitted Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Renew message containing an IA_NA option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 8: The NUT transmits a properly formatted Renew message containing an IA_NA option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.4.1.6: Transmission of Rebind message for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Rebind messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.4 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Rebind message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message (TN1 sets T1 to 50s and T2 to 80s).
4. TN1 does not respond to any Renew messages transmitted after T1.
5. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Part B: Rebind message format with Option Request Option (Domain Search List option)

6. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message (TN1 sets T1 to 50s and T2 to 80s).
9. TN1 does not respond to any Renew messages transmitted after T1.
10. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5: The NUT transmits a properly formatted Rebind message containing an IA_NA option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 10: The NUT transmits a properly formatted Rebind message containing an IA_NA option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.4.1.7: Transmission of Release messages for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Release messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.6 and 22.7
- [DHCP 3646] – Section 3, 4 and 5

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Release message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
4. Configure the client to release the IPv6 address.
5. Observe the messages transmitted on Link A.

Part B: Release message format with Option Request Option (Domain Search List option)

6. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
9. Configure the client to release the IPv6 address.
10. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5 The NUT transmits a properly formatted Release message containing an IA_NA option and the Release message must not contain a DNS Recursive Name Server option.
- *Part B*

  Step 10: The NUT transmits a properly formatted Release message containing an IA_NA option and the Release message must not contain a Domain Search List option.

Possible Problems:

Test DHCP_CONF.4.1.8: Transmission of Decline messages for DNS Configuration options

Purpose: To verify a client device transmits properly formatted Decline messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 18.1, 18.1.7 and 22.7
- [DHCP 3646] – Section 3, 4 and 5

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Decline message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
4. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
5. Observe any messages transmitted on Link A.

Part B: Decline message format with Option Request Option (Domain Search List option)

6. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Address Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message.
9. After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.
10. Observe any messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5 The NUT transmits a properly formatted Decline message containing an IA_NA option and the Decline message must not contain a DNS Recursive Name Server option.
- *Part B*

  Step 10: The NUT transmits a properly formatted Decline message containing an IA_NA option and the Decline message must not contain a Domain Search List option.

Possible Problems:

- None.

Test DHCP_CONF.4.1.9: Client Initiated Exchange - Reception of Reply messages for DNS Configuration options

Purpose: To verify a client device properly handles the reception of Reply messages for DNS Configuration options after initiating an exchange.

References:

- [DHCP 3315] – 18.1.8 and 22.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Address Assignment, Renew message and Rebind message. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Using DNS Recursive Name Server option

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
4. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
5. Observe the messages transmitted on Link A.

Part B: Using Domain Search List option

6. Enable DHCPv6 which is configured to require a DNS Recursive Name Server and a Domain Search List option in parallel with Address Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address and a Domain Search List option including "TEST.EXAMPLE.COM".
9. NUT transmits an Echo Request to "DHCPv6".
10. Observe the messages transmitted on Link A.

Part C: DNS Recursive Name Server option updated by the server

11. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT (TN1 sets T1 to 50s and T2 to 80s).
12. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
13. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
14. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
15. Observe the messages transmitted on Link A.
16. Wait T1 (50) seconds.

17. Upon the reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN4's Global address.
18. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
19. Observe the messages transmitted on Link A.

Part D: Domain Search List option updated by the server

20. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT (TN1 sets T1 to 50s and T2 to 80s).
21. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
22. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN4's Global address and Domain Search List option including "TEST.EXAMPLE.COM".
23. NUT transmits an Echo Request to "DHCPv6".
24. Observe the messages transmitted on Link A.
25. Wait T1 (50) seconds.
26. Upon the reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address and Domain Search List option including "TEST.COM".
27. NUT transmits an Echo Request to "DHCPv6".
28. Observe the messages transmitted on Link A.

Part E: DNS Recursive Name Server option updated by the server

29. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT (TN1 sets T1 to 50s and T2 to 80s).
30. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
31. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
32. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
33. Observe the messages transmitted on Link A.
34. Disconnect TN1 from the link, after time T2 (80) seconds, reconnect TN1 into the link.
35. Upon the reception of a Rebind message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN4's Global address.
36. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
37. Observe the messages transmitted on Link A.

Part F: Domain Search List option updated by the server

38. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Address Assignment on the NUT (TN1 sets T1 to 50s and T2 to 80s).
39. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
40. Upon the reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address and Domain Search List option including "TEST.EXAMPLE.COM".
41. NUT transmits an Echo Request to "DHCPv6".
42. Observe the messages transmitted on Link A.
43. Disconnect TN1 from the link, after time T2 (80) seconds, reconnect TN1 into the link.

44. Upon the reception of a Rebind message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address and Domain Search List option including "TEST.COM".
45. NUT transmits an Echo Request to "DHCPv6".
46. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 5: The NUT transmitted a DNS Standard Query to TN3.
- *Part B*
  Step 10: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.
- *Part C*
  Step 15: The NUT transmitted a DNS Standard Query to TN3.
  Step 19: The NUT transmitted a DNS Standard Query to TN4.
- *Part D*
  Step 24: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.
  Step 28: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.COM" to TN3.
- *Part E*
  Step 33: The NUT transmitted a DNS Standard Query to TN3.
  Step 37: The NUT transmitted a DNS Standard Query to TN4.
- *Part F*
  Step 42: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE. COM" to TN3.
  Step 46: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.COM" to TN3.

Possible Problems:

- In Part A, B, C, D, E and Part F, if NUT doesn't have the command that send an Echo Request, NUT can use alternate command that send a DNS Standard Query.

Section 5: RFC 3646 - Server Specification

Scope

The following tests cover specifications for the sever implementation of the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request for Comments 3646.
These tests verify the process for passing a list of available DNS recursive name servers and a domain search list to a client in parallel with Address Assignment.

Overview

These tests are designed to verify the readiness of a DHCPv6 server implementation vis-à-vis the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 specification (Other configuration information function concurrently processing Address Assignment).

Test DHCP_CONF.5.1.1: DNS Recursive Name Server Option Format

Purpose: To verify the DHCP server transmits the correct DNS Recursive Name Server Option format.

References:

- [DHCP 3646] – Section 3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following DNS Recursive Name Server option values:

- An option-code set to OPTION_DNS_SERVERS(23)
- An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
- DNS-recursive-name-server set to IPv6 address of DNS recursive name server

Possible Problems:

- None.

Test DHCP_CONF.5.1.2: Domain Search List Option Format

Purpose: To verify the DHCP server transmits the correct Domain Search List Option format.

References:

- [DHCP 3646] – Section 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_NA option and an Option Request Option (Domain Search List Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Domain Search List option values:

- An option-code set to OPTION_DOMAIN_LIST(24)
- An option-length set to the length of the 'searchlist' field in octets
- DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.5.1.3: Configuration of DNS options

Purpose: To verify the DHCP server transmits a message with correctly configured DNS option

References:

- [DHCP 3315] – Section 18.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide only DNS Recursive Name Server option in parallel with Address Assignment in part A. DHCPv6 is configured to provide DNS Recursive Name Server option and DNS Domain Search List Option in parallel with Address Assignment in part B. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Returning of DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
3. Observe the messages transmitted on Link A.

Part B: Returning of DNS Recursive Name Server option and Domain Search List Option

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Advertise message containing only a DNS Recursive Name Server option.
- *Part B*

  Step 6: The NUT transmits a properly formatted Advertise message containing a DNS Recursive Name Server option and a Domain Search List Option.

Possible Problems:

- None.

Test DHCP_CONF.5.1.4: Transmission of Advertise Messages for DNS Configuration options

Purpose: To verify a server device transmits Advertise messages in response to Solicit messages for DNS Configuration options.

References:

- [DHCP 3315] – Section 17.2.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Advertise message in response to Solicit message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. Observe the messages transmitted on Link A.

Part B: Advertise message in response to Solicit message with ORO (Domain Search List option)

3. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (Domain Search List Option).
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Advertise message containing the following elements:
  - Destination address set to TN1's unicast address same as the Solicit message's source address
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as the Solicit message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Solicit message's Client Identifier option
  - A DNS Recursive Name Server option set to the following values:
    - An option-code set to OPTION_DNS_SERVERS(23)
    - An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
    - DNS-recursive-name-server set to IPv6 address of DNS recursive name server
- *Part B*

  Step 4: The NUT transmits a properly formatted Advertise message containing the following elements:

- Destination address set to TN1's unicast address same as the Solicit message's source address
- A msg-type field set to ADVERTISE (2)
- A transaction-id set to the same as Solicit message's transaction-id
- A Server Identifier option (containing a DUID)
- A Client Identifier option set to the same as Solicit message's Client Identifier option
- A Domain Search List option set to the following values:
    - An option-code set to OPTION_DOMAIN_LIST(24)
    - An option-length set to the length of the 'searchlist' field in octets
    - DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.5.1.5: Transmission of Reply Messages for DNS Configuration options

Purpose: To verify a server device transmits Reply messages in response to Request messages for DNS Configuration options.

References:

- [DHCP 3315] – Section 17.2.3
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reply message in response to Request message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. Observe the messages transmitted on Link A.

Part B: Reply message in response to Request message with ORO (Domain Search List option)

4. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (Domain Search List Option).
5. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (Domain Search List Option) on Link A.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Reply message containing the following elements:

  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - A DNS Recursive Name Server option set to the following values:
    - An option-code set to OPTION_DNS_SERVERS(23)

- An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
- DNS-recursive-name-server set to IPv6 address of DNS recursive name server

- *Part B*

  Step 4: The NUT transmits a properly formatted Reply message containing the following elements:

  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - A Domain Search List option set to the following values:
    - An option-code set to OPTION_DOMAIN_LIST(24)
    - An option-length set to the length of the 'searchlist' field in octets
    - DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.5.1.6 Reception of Renew messages for DNS Configuration options

Purpose: To verify a server device properly handles the reception of Renew messages for DNS Configuration options.

References:

- [DHCP 3315] – Section 18.2 and 18.2.3
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reception of Renew message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. After the reception of a Reply message from the NUT, TN1 transmits a valid Renew message including an IA_NA option with IA Address option and Option Request Option (DNS Recursive Name Server option) on Link A.
4. Observe the messages transmitted on Link A.

Part B: Reception of Renew message with ORO (Domain Search List option)

5. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (Domain Search List option) on Link A.
6. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (Domain Search List option) on Link A.
7. After the reception of a Reply message from the NUT, TN1 transmits a valid Renew message including an IA_NA option with IA Address option and Option Request Option (Domain Search List option) on Link A.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_NA option with IA Address option and DNS Recursive Name Server option.

- *Part B*

  Step 8: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_NA option with IA Address option and Domain Search List option.

Possible Problems:

- None.

Test DHCP_CONF.5.1.7 Reception of Rebind messages for DNS Configuration options

Purpose: To verify a server device properly handles the reception of Rebind messages for DNS Configuration options.

References:

- [DHCP 3315] – Section 18.2 and 18.2.4
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Address Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reception of Rebind message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. After the reception of a Reply message from the NUT, TN1 transmits a valid Rebind message including an IA_NA option with IA Address option and Option Request Option (DNS Recursive Name Server option) on Link A.
4. Observe the messages transmitted on Link A.

Part B: Reception of Rebind message with ORO (Domain Search List option)

5. TN1 transmits a valid Solicit message with an IA_NA option and an Option Request Option (Domain Search List option) on Link A.
6. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_NA option and an Option Request Option (Domain Search List option) on Link A.
7. After the reception of a Reply message from the NUT, TN1 transmits a valid Rebind message including an IA_NA option with IA Address option and Option Request Option (Domain Search List option) on Link A.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_NA option with IA Address option and DNS Recursive Name Server option.
- *Part B*

  Step 8: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_NA option with IA Address option and Domain Search List option.

Possible Problems:

- None.

Section 6: RFC 3646 - Relay Agent Specification

Scope

The following tests cover specifications for the relay agent implementation of the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3646. These tests verify the process for relaying specific messages regarding a list of available DNS recursive name servers and a domain search list from a server in parallel with Address Assignment.

Overview

These tests are designed to verify the readiness of a DHCPv6 relay agent implementation vis-à-vis the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 specification (Other configuration information function concurrently processing Address Assignment).

Test DHCP_CONF.6.1.1: Relay and Transmission of Advertise Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Advertise messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 20.2 and 20.3
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Advertise message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. Observe the messages transmitted on Link B.

Part B: Relay-Reply Advertise message transmission through the layered Relay agents for DNS Recursive Name Server option

5. Enable DHCPv6 on the NUT.
6. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
7. TN4 transmits a valid Relay-forward Solicit message to the NUT.
8. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
9. Observe the messages transmitted on Link B.

Part C: Advertise message transmission for DNS Domain Search List option

10. Enable DHCPv6 on the NUT.
11. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
12. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
13. Observe the messages transmitted on Link B.
14. Observe the messages transmitted on Link B.

Part D: Relay-Reply Advertise message transmission through the layered Relay agents for DNS Domain Search List option

15. Enable DHCPv6 on the NUT.
16. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
17. TN4 transmits a valid Relay-forward Solicit message to the NUT.

18. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
19. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Advertise message containing the following elements:
  - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Advertise message
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A Server Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A Client Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - An IA_NA option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A DNS Recursive Name Server option set to the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
- *Part B*

  Step 9: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following elements:
  - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Advertise message from TN2
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to 0
  - A link-address set to the same as Relay-Reply Advertise message's link-address in Relay Message option
  - A peer-address set to the same as Relay-Reply Advertise message's peer-address in Relay Message option
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Advertise message
    - An Advertise message containing the following elements:
      - A transaction-id set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - A Server Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - A Client Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - An IA_NA option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2

- A DNS Recursive Name Server option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2

- *Part C*

  Step 14: The NUT transmits a properly formatted Advertise message containing the following elements:
  - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Advertise message
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A Server Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A Client Identifier option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - An IA_NA option set to the same as the Advertise message's one in Relay Message option of the Relay-Reply Advertise message
  - A DNS Domain Search List option set to the Advertise message's one in Relay Message option of the Relay-Reply Advertise message

- *Part D*

  Step 19: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following elements:
  - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Advertise message from TN2
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to 0
  - A link-address set to the same as Relay-Reply Advertise message's link-address in Relay Message option
  - A peer-address set to the same as Relay-Reply Advertise message's peer-address in Relay Message option
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Advertise message
    - An Advertise message containing the following elements:
      - A transaction-id set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - A Server Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - A Client Identifier option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - An IA_NA option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2
      - A DNS Domain Search List option set to the same as the Relay-reply Advertise message's one in Reply Message option from TN2

Possible Problems:

- None.

Test DHCP_CONF.6.1.2: Relay and Transmission of Reply Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Reply messages for DNS Configuration options.

References:
- [DHCP 3315] – Sections 20.2 and 20.3
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Reply message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
5. After the reception of a Relay-forward Request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
6. Observe the messages transmitted on Link B.

Part B: Relay-Reply Reply message transmission through the layered Relay agents for DNS Recursive Name Server option

7. Enable DHCPv6 on the NUT.
8. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
9. TN4 transmits a valid Relay-forward Solicit message to the NUT.
10. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
11. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
12. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
13. TN4 transmits a valid Relay-forward Request message to the NUT.
14. After the reception of a Relay-forward Request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
15. Observe the messages transmitted on Link B.

Part C: Reply message transmission for DNS Domain Search List option

16. Enable DHCPv6 on the NUT.

17. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
18. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
19. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
20. After the reception of a Relay-forward Request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
21. Observe the messages transmitted on Link B.

Part D: Relay-Reply Reply message transmission through the layered Relay agents for DNS Domain Search List option

22. Enable DHCPv6 on the NUT.
23. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
24. TN4 transmits a valid Relay-forward Solicit message to the NUT.
25. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
26. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
27. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
28. TN4 transmits a valid Relay-forward Request message to the NUT.
29. After the reception of a Relay-forward Request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
30. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 6: The NUT transmits a properly formatted Reply message containing the following elements:
  - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Reply message
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A Server Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A Client Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - An IA_NA option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A DNS Recursive Name Server option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
- *Part B*

Step 15: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:

- Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Reply message from TN2
- A msg-type field set to RELAY-REPL(13)
- A hop-count set to 0
- A link-address set to the same as Relay-Reply Reply message's link-address in Relay Message option
- A peer-address set to the same as Relay-Reply Reply message's peer-address in Relay Message option
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Reply message
    - A Reply message containing the following elements:
        - A transaction-id set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
        - A Server Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
        - A Client Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
        - An IA_NA option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
        - A DNS Recursive Name Server option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2

- *Part C*

  Step 21: The NUT transmits a properly formatted Reply message containing the following elements:

    - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Reply message
    - A msg-type field set to REPLY(7)
    - A transaction-id set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A Server Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A Client Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - An IA_NA option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A DNS Domain Search List option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message

- *Part D*

  Step 30: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:

    - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Reply message from TN2

- A msg-type field set to RELAY-REPL(13)
- A hop-count set to 0
- A link-address set to the same as Relay-Reply Reply message's link-address in Relay Message option
- A peer-address set to the same as Relay-Reply Reply message's peer-address in Relay Message option
- A Relay Message option with following values:
  - An option-code set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Reply message
  - A Reply message containing the following elements:
    - A transaction-id set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
    - A Server Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
    - A Client Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
    - An IA_NA option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
    - A DNS Domain Search List option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2

Possible Problems:

- None.

Test DHCP_CONF.6.1.3: Relay and Transmission of Relay-forward Solicit Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Solicit messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Solicit message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Solicit message transmission through the layered Relay agents for DNS Recursive Name Server option(w/o Interface-ID Option)

4. Enable DHCPv6 on the NUT.
5. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
6. TN4 transmits a valid Relay-forward Solicit message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Solicit message transmission through the layered Relay agents for DNS Recursive Name Server option(w Interface-ID Option)

8. Enable DHCPv6 on the NUT.
9. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
10. TN4 transmits a valid Relay-forward Solicit message to the NUT.
11. Observe the messages transmitted on Link A.

Part D: Relay-forward Solicit message transmission for DNS Domain Search List option

12. Enable DHCPv6 on the NUT.
13. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
14. Observe the messages transmitted on Link A.

Part E: Relay-forward Solicit message transmission through the layered Relay agents for DNS Domain Search List option(w/o Interface-ID Option)

15. Enable DHCPv6 on the NUT.
16. TN3 transmits a valid Solicit message including an IA_NA and an Option Request Option (DNS Domain Search List option) option on Link C.
17. TN4 transmits a valid Relay-forward Solicit message to the NUT.
18. Observe the messages transmitted on Link A.

Part F: Relay-forward Solicit message transmission through the layered Relay agents for DNS Domain Search List option(w Interface-ID Option)

19. Enable DHCPv6 on the NUT.
20. TN3 transmits a valid Solicit message including an IA_NA and an Option Request Option (DNS Domain Search List option) option on Link C.
21. TN4 transmits a valid Relay-forward Solicit message to the NUT.
22. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Solicit message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Solicit message
    - A Solicit message containing the following elements:
      - A meg-type set to the value of 1 (Solicit)
      - A transaction-id set to the same as the Solicit message's transaction-id
      - A Client Identifier option set to the same as the Solicit message's Client Identifier option
      - An IA_NA option set to the same as the Solicit message's Client Identifier option
      - An Option Request option(DNS Recursive Name Server option) set to the same as the Solicit message's Option Request option(DNS Recursive Name Server option)
- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Solicit message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field

- A DHCP-relay-message set to an Relay-forward message
- The Relay-forward message set to same as the received Relay-forward Solicit message

- *Part C*

  Step 7: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Solicit message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Solicit message
- *Part D*

  Step 14: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Solicit message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Solicit message
    - A Solicit message containing the following elements:
      - A meg-type set to the value of 1 (Solicit)
      - A transaction-id set to the same as the Solicit message's transaction-id
      - A Client Identifier option set to the same as the Solicit message's Client Identifier option
      - An IA_NA option set to the same as the Solicit message's Client Identifier option
      - An Option Request option(DNS Domain Search List option) set to the same as the Solicit message's Option Request option(DNS Domain Search List option)
- *Part E*

Step 18: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:

- Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
- A msg-type field set to RELAY-FORW(12)
- A hop-count set to 1
- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Solicit message(Step19)'s source address
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Solicit message

- *Part F*

  Step 22: The NUT transmits a properly formatted Relay-forward Solicit message containing the following elements:

    - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
    - A msg-type field set to RELAY-FORW(12)
    - A hop-count set to 1
    - An Interface-ID option
    - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
    - A peer-address set to the same as the Relay-forward Solicit message(Step19)'s source address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Relay-forward message
        - The Relay-forward message set to same as the received Relay-forward Solicit message

Possible Problems:

- None.

Test DHCP_CONF.6.1.4: Relay and Transmission of Relay-forward Request Messages for Configuration options

Purpose: To verify a relay agent device relays and transmits Request messages for DNS Configuration options.

References:
- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Request message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
3. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
4. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
5. Observe the messages transmitted on Link A.

Part B: Relay-forward Request message transmission through the layered Relay agents for DNS Recursive Name Server option(w/o Interface-ID Option)

6. Enable DHCPv6 on the NUT.
7. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
8. TN4 transmits a valid Relay-forward Solicit message to the NUT.
9. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
10. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
11. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
12. TN4 transmits a valid Relay-forward Request message to the NUT.
13. Observe the messages transmitted on Link A.

Part C: Relay-forward Request message transmission through the layered Relay agents for DNS Recursive Name Server option(w Interface-ID Option)

14. Enable DHCPv6 on the NUT.
15. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
16. TN4 transmits a valid Relay-forward Solicit message to the NUT.

17. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
18. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
19. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
20. TN4 transmits a valid Relay-forward Request message to the NUT.
21. Observe the messages transmitted on Link A.

Part D: Relay-forward Request message transmission for DNS Domain Search List option

22. Enable DHCPv6 on the NUT.
23. TN1 transmits a valid Solicit message including an IA_NA option on Link B.
24. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
25. After the reception of an Advertise message from the NUT on Link B, the TN1 transmits valid Request message including an IA_NA option on Link B.
26. Observe the messages transmitted on Link A.

Part E: Relay-forward Request message transmission through the layered Relay agents for DNS Domain Search List option(w/o Interface-ID Option)

27. Enable DHCPv6 on the NUT.
28. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
29. TN4 transmits a valid Relay-forward Solicit message to the NUT.
30. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
31. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
32. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
33. TN4 transmits a valid Relay-forward Request message to the NUT.
34. Observe the messages transmitted on Link A.

Part F: Relay-forward Request message transmission through the layered Relay agents for DNS Domain Search List option(w Interface-ID Option)

35. Enable DHCPv6 on the NUT.
36. TN3 transmits a valid Solicit message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
37. TN4 transmits a valid Relay-forward Solicit message to the NUT.
38. After the reception of a Relay-forward Solicit message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Advertise message to the NUT.
39. After the reception of Relay-Reply Advertise message from the NUT on Link B, the TN4 transmits a valid Advertise message to TN3.
40. TN3 transmit a valid Request message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
41. TN4 transmits a valid Relay-forward Request message to the NUT.
42. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT’s global address on Link B)
  - A peer-address set to the same as the Request message’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Request message
    - A Request message containing the following elements:
      - A meg-type set to the value of 3 (Request)
      - A transaction-id set to the same as the Request message’s transaction-id
      - A Client Identifier option set to the same as the Request message’s Client Identifier option
      - A Server Identifier option set to the same as the Request message’s Server Identifier option
      - An IA_NA option set to the same as the Request message’s Server Identifier option
      - An Option Request option(DNS Recursive Name Server option) set to the same as the Request message’s Option Request option(DNS Recursive Name Server option)
- *Part B*

  Step 13: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT’s global address on Link B)
  - A peer-address set to the same as the Relay-forward Request message(Step17)’s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Request message
- *Part C*

  Step 21: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)

- A msg-type field set to RELAY-FORW(12)
- A hop-count set to 1
- An Interface-ID option
- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Request message(Step17)'s source address
- A Relay Message option with following values:
  - An option-code set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Relay-forward message
  - The Relay-forward message set to same as the received Relay-forward Request message

- *Part D*

  Step 26: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Request message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Request message
    - A Request message containing the following elements:
      - A meg-type set to the value of 3 (Request)
      - A transaction-id set to the same as the Request message's transaction-id
      - A Client Identifier option set to the same as the Request message's Client Identifier option
      - A Server Identifier option set to the same as the Request message's Server Identifier option
      - An IA_NA option set to the same as the Request message's Server Identifier option
      - An Option Request option(DNS Domain Search List option) set to the same as the Request message's Option Request option(DNS Domain Search List option)

- *Part E*

  Step 34: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1

- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Request message(Step17)'s source address
- A Relay Message option with following values:
  - An option-code set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Relay-forward message
  - The Relay-forward message set to same as the received Relay-forward Request message

- *Part F*

  Step 42: The NUT transmits a properly formatted Relay-forward Request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Request message(Step17)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Request message

Possible Problems:

- None.

Test DHCP_CONF.6.1.5: Relay and Transmission of Relay-forward Renew Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Renew messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Renew message transmission for DNS Recursive Name Server option

1. Common Test Setup 1.1 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
2. TN1 transmits a valid Renew including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Renew message transmission through the layered Relay agents for DNS Recursive Name Server option(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
5. TN3 transmits a valid Renew message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
6. TN4 transmits a valid Relay-forward Renew message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Renew message transmission through the layered Relay agents for DNS Recursive Name Server option(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
9. TN3 transmits a valid Renew message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
10. TN4 transmits a valid Relay-forward Renew message to the NUT.
11. Observe the messages transmitted on Link A.

Part D: Relay-forward Renew message transmission for DNS Domain Search List option

12. Common Test Setup 1.1 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
13. TN1 transmits a valid Renew message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
14. Observe the messages transmitted on Link A.

Part E: Relay-forward Renew message transmission through the layered Relay agents for DNS Domain Search List option(w/o Interface-ID Option)

15. Common Test Setup 1.2 is performed for Address Assignment and DNS Domain Search List configuration for Relay agent device.
16. TN3 transmits a valid Renew message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
17. TN4 transmits a valid Relay-forward Renew message to the NUT.
18. Observe the messages transmitted on Link A.

Part F: Relay-forward Renew message transmission through the layered Relay agents for DNS Domain Search List option(w Interface-ID Option)

19. Common Test Setup 1.2 is performed for Address Assignment and DNS Domain Search List configuration for Relay agent device.
20. TN3 transmits a valid Renew message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link C.
21. TN4 transmits a valid Relay-forward Renew message to the NUT.
22. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Renew message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Renew message
    - A Renew message containing the following elements:
      - A meg-type set to the value of 5 (Renew)
      - A transaction-id set to the same as the Renew message's transaction-id
      - A Client Identifier option set to the same as the Renew message's Client Identifier option
      - A Server Identifier option set to the same as the Renew message's Server Identifier option
      - An IA_NA option set to the same as the Renew message's Server Identifier option
      - An Option Request option(DNS Recursive Name Server option) set to the same as the Renew message's Option Request option(DNS Recursive Name Server option)
- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)

- A msg-type field set to RELAY-FORW(12)
- A hop-count set to 1
- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
- A Relay Message option with following values:
  - An option-code set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Relay-forward message
  - The Relay-forward message set to same as the received Relay-forward Renew message

- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Renew message

- *Part D*

  Step 14: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Renew message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Renew message
    - A Renew message containing the following elements:
      - A meg-type set to the value of 5 (Renew)
      - A transaction-id set to the same as the Renew message's transaction-id

- A Client Identifier option set to the same as the Renew message's Client Identifier option
  - A Server Identifier option set to the same as the Renew message's Server Identifier option
  - An IA_NA option set to the same as the Renew message's Server Identifier option
  - An Option Request option(DNS Domain Search List option) set to the same as the Renew message's Option Request option(DNS Domain Search List option)

- *Part E*

  Step 18: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Renew message

- *Part F*

  Step 22: The NUT transmits a properly formatted Relay-forward Renew message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Renew message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Renew message

Possible Problems:

- None.

Test DHCP_CONF.6.1.6: Relay and Transmission of Relay-forward Rebind Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Rebind messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Rebind message transmission for DNS Recursive Name Server option

1. Common Test Setup 1.1 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
2. TN1 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Rebind message transmission through the layered Relay agents for DNS Recursive Name Server option(w/o Interface-ID Option)

4. Common Test Setup 1.2 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
5. TN3 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
6. TN4 transmits a valid Relay-forward Rebind message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Rebind message transmission through the layered Relay agents for DNS Recursive Name Server option(w Interface-ID Option)

8. Common Test Setup 1.2 is performed for Address Assignment and DNS Recursive Name configuration for Relay agent device.
9. TN3 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Recursive Name Server option) on Link C.
10. TN4 transmits a valid Relay-forward Rebind message to the NUT.
11. Observe the messages transmitted on Link A.

Part D: Relay-forward Rebind message transmission for DNS Domain Search List option

12. Common Test Setup 1.1 is performed for Address Assignment and DNS Domain Search List configuration for Relay agent device.
13. TN1 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Domain Search List option) on Link B.
14. Observe the messages transmitted on Link A.

Part E: Relay-forward Rebind message transmission through the layered Relay agents for DNS Domain Search List option(w/o Interface-ID Option)

15. Common Test Setup 1.2 is performed for Address Assignment and DNS Domain Search List configuration for Relay agent device.
16. TN3 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Domain Search List) on Link C.
17. TN4 transmits a valid Relay-forward Rebind message to the NUT.
18. Observe the messages transmitted on Link A.

Part F: Relay-forward Rebind message transmission through the layered Relay agents for DNS Domain Search List option(w Interface-ID Option)

19. Common Test Setup 1.2 is performed for Address Assignment and DNS Domain Search List configuration for Relay agent device.
20. TN3 transmits a valid Rebind message including an IA_NA option and an Option Request Option (DNS Domain Search List) on Link C.
21. TN4 transmits a valid Relay-forward Rebind message to the NUT.
22. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Rebind message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Rebind message
    - A Rebind message containing the following elements:
      - A meg-type set to the value of 6 (Rebind)
      - A transaction-id set to the same as the Rebind message's transaction-id
      - A Client Identifier option set to the same as the Rebind message's Client Identifier option
      - An IA_NA option set to the same as the Rebind message's Client Identifier option
      - An Option Request option(DNS Recursive Name Server option) set to the same as the Rebind message's Option Request option(DNS Recursive Name Server option)
- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1

- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
- A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
- A Relay Message option with following values:
  - An option-code set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Relay-forward message
  - The Relay-forward message set to same as the received Relay-forward Rebind message

- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Rebind message

- *Part D*

  Step 14: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Rebind message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Rebind message
    - A Rebind message containing the following elements:
      - A meg-type set to the value of 6 (Rebind)
      - A transaction-id set to the same as the Rebind message's transaction-id
      - A Client Identifier option set to the same as the Rebind message's Client Identifier option

- An IA_NA option set to the same as the Rebind message's Client Identifier option
- An Option Request option(DNS Domain Search List option) set to the same as the Rebind message's Option Request option(DNS Domain Search List option)

- *Part E*

  Step 18: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
    - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
    - A msg-type field set to RELAY-FORW(12)
    - A hop-count set to 1
    - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
    - A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Relay-forward message
        - The Relay-forward message set to same as the received Relay-forward Rebind message
- *Part F*

  Step 22: The NUT transmits a properly formatted Relay-forward Rebind message containing the following elements:
    - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
    - A msg-type field set to RELAY-FORW(12)
    - A hop-count set to 1
    - An Interface-ID option
    - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
    - A peer-address set to the same as the Relay-forward Rebind message(Step9)'s source address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Relay-forward message
        - The Relay-forward message set to same as the received Relay-forward Rebind message

Possible Problems:

- None.

Section 7: RFC 3736 - Client Specification

Scope

The following tests cover specifications for the client implementation of the Stateless Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3736.
These tests verify the process for receiving a list of available DNS recursive name servers and a domain search list from a server in Stateless Dynamic Host Configuration Protocol for IPv6.

Overview

These tests are designed to verify the readiness of a DHCPv6 client implementation vis-à-vis the Stateless Dynamic Host Configuration Protocol for IPv6 specification (Focus on DNS recursive name servers and Domain search list option).

Test DHCP_CONF.7.1.1: Basic Message Exchanges

Purpose: To verify that the client device properly handles the reception of DHCPv6 messages during a basic message exchange.

References:

- [DHCP 3315] – Section 17.1.4, 18.1.8 and 19.4.5
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Observe the messages transmitted on Link A.
3. Upon reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
4. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
5. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT must transmit an Information-request message.
Step 5: The NUT must process the correct Reply message and transmit a DNS Standard Query to TN3.

Possible Problems:

In Part A Step5, if NUT doesn't have the command that send an Echo Request, NUT can use alternate command that send a DNS Standard Query.

Test DHCP_CONF.7.1.2: Implementation of DHCP constants

Purpose: To verify that the client listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.1, 5.2 and 13
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Multicast Addresses

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Valid UDP port

3. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
4. Observe the messages transmitted on Link A.
5. Upon reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address to UDP port 546.
6. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
7. Observe the messages transmitted on Link A.

Part C: Invalid UDP port

8. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
9. Upon reception of a Information-request message from the NUT, TN1 transmits a Reply message to UDP destination port 33536.
10. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must transmit an Information-request message with a destination address set to the "ALL_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
- *Part B*

  Step 4: The NUT must transmit an Information-request message with a destination UDP port set to 547.

Step 7: The NUT must process the correct Reply message and transmit a DNS Standard Query to TN3.

- *Part C*

  Step 10: The NUT should send a Destination Unreachable message to TN1 link-local address. The source address of the packet must be the NUT's unicast address. The code field must be set to "4" port unreachable and the invoking advertise packet included in the Error Message must not exceed minimum IPv6 MTU.

Possible Problems:

- In Part B Step 6, if NUT doesn't have the command that send an Echo Request, NUT can use alternate command that send a DNS Standard Query.

Test DHCP_CONF.7.1.3: Client Message Format

Purpose: To verify that the client transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6, 15.1 and 16
- [DHCP 3736] – Section 5.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Information-request message containing the following elements:

- Source Address set to Link-Local
- The msg-type field was set to the value of 11 (Information-request)
- A header containing a non-zero value Transaction ID

Possible Problems:

- None.

Test DHCP_CONF.7.1.4: Option Request Option Format

Purpose: To verify that the DHCP client transmits the correct Option Request Option format.

References:

- [DHCP 3315] – Section 17.1.1 and 22.7
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Option Request Option Format (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Option Request Option Format (Domain Search List option)

3. Enable DHCPv6 which is configured to require a Domain Search List option on the NUT.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Information-request message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to DNS Recursive Name Server Option (23)
- *Part B*

  Step 4: The NUT transmits a properly formatted Information-request message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to Domain Search List option (24)

Possible Problems:

- None.

Test DHCP_CONF.7.1.5: Transmission of Information-request message

Purpose: To verify a client device properly transmits Information-request messages.

References:

- [DHCP 3315] – Sections 5.5, 14, 15.1, 16 and 18.1.5
- [DHCP 3646] – Sections 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network according to the Common Topology. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Reliability of DHCPv6 Retransmission

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Observe the first Information-request message transmitted on Link A.
3. Wait for second Information-request message.
4. Observe the second Information-request message transmitted on Link A.

Part B: Retransmission of Information-request message.

5. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
6. Observe the time the first Information-request message was transmitted on Link A.
7. Wait for second Information-request message.
8. Observe the time the second Information-request message was transmitted on Link A.

Part C: Maximum Retransmission Time of Information-request message.

9. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
10. Continue to capture Information-request message until RTprev = MRT + MRT * RAND (108 <= PTprev <= 132)
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Information-request message containing the following elements:
    - Source Address set to Link-Local
    - The msg-type field was set to the value of 11 (Information-request)
    - A header containing a Transaction ID
    - An Option Request Option which requested-option-code-n set to DNS Recursive Name Server Option (23)

  Step 4: The NUT transmits a properly formatted Information-request message with the same values as in Step 2. The transaction ID is the same for all retransmitted messages.
- *Part B*

Step 6: The NUT transmits a properly formatted Information-request message.
Step 8: The NUT transmits a properly formatted Information-request message according to the Second message in the chart below.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 0.9 sec)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1) = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part C*

  Step 11: The NUT should properly transmit Information-request messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 0.9 sec)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1 sec) = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120
X+1 message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120

Possible Problems:

- None.

Test DHCP_CONF.7.1.6: Client Initiated Exchange - Reception of Reply messages for DNS Configuration options

Purpose: To verify a client device properly handles the reception of Reply messages for DNS Configuration options after initiating an exchange.

References:

- [DHCP 3315] – 18.1.8 and 22.7
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Using DNS Recursive Name Server option

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the NUT.
2. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
3. NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".
4. Observe the messages transmitted on Link A.

Part B: Using Domain Search List option

5. Enable DHCPv6 which is configured to require a DNS Recursive Name Server and a Domain Search List option on the NUT.
6. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address and a Domain Search List option including "TEST.EXAMPLE.COM".
7. NUT transmits an Echo Request to "DHCPv6".
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmitted a DNS Standard Query to TN3.
- *Part B*

  Step 8: The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.

Possible Problems:

- In Part A and Part B, if NUT doesn't have the command that send an Echo Request, NUT can use alternate command that send a DNS Standard Query.

Test DHCP_CONF.7.1.7: Reception of Invalid Reply message

Purpose: To verify that a client device properly handles the reception of invalid Reply messages.

References:

- [DHCP 3315] – Sections 15, 15.10 and 22.7

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: No Server Identifier option

1. Upon the reception of an Information-request message, TN1 transmits a Reply message that does not contain a Server Identifier option and contain a DNS Recursive Name Server option including TN3's Global address.
2. Observe the messages transmitted on Link A.

Part B: Transaction ID Mismatch

3. Upon the reception of an Information-request message, TN1 transmits a Reply message with a DNS Recursive Name Server option including TN3's Global address. The Reply message contains a transaction-id field value that does not match the value the client used in its Information-request messages.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the invalid Reply message. The NUT continued to transmit its Information-request message.
- *Part B*

  Step 4: The NUT must silently discard the invalid Reply message. The NUT continued to transmit its Information-request message.

Possible Problems:

- None

Test DHCP_CONF.7.1.8: Client Message Validation

Purpose: To verify a client device properly discards all Solicit, Request, Confirm, Renew, Rebind, Decline, Release, Information-request, Relay-forward and Relay-reply messages.

References:

- [DHCP 3315] – Sections 15.2, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.12, 15.13 and 15.14
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: Solicit message (type 1)

1. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
2. The NUT should receive DNS Recursive Name Server address from TN1.
3. TN1 transmits a Solicit message to the NUT port 546.
4. Observe the messages transmitted on Link A.

Part B: Request message (type 3)

5. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
6. The NUT should receive DNS Recursive Name Server address from TN1.
7. TN1 transmits a Request message to the NUT port 546.
8. Observe the messages transmitted on Link A.

Part C: Confirm message (type 4)

9. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
10. The NUT should receive DNS Recursive Name Server address from TN1.
11. TN1 transmits a Confirm message to the NUT port 546.
12. Observe the messages transmitted on Link A.

Part D: Renew message (type 5)

13. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
14. The NUT should receive DNS Recursive Name Server address from TN1.
15. TN1 transmits a Renew message to the NUT port 546.
16. Observe the messages transmitted on Link A.

Part E: Rebind message (type 6)

17. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
18. The NUT should receive DNS Recursive Name Server address from TN1.
19. TN1 transmits a Rebind message to the NUT port 546.
20. Observe the messages transmitted on Link A.

Part F: Decline message (type 9)

21. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
22. The NUT should receive DNS Recursive Name Server address from TN1.
23. TN1 transmits a Decline message to the NUT port 546.
24. Observe the messages transmitted on Link A.

Part G: Release message (type 8)

25. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
26. The NUT should receive DNS Recursive Name Server address from TN1.
27. TN1 transmits a Release message to the NUT port 546.
28. Observe the messages transmitted on Link A.

Part H: Information-request message (type 11)

29. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
30. The NUT should receive DNS Recursive Name Server address from TN1.
31. TN1 transmits a Information-request message to the NUT port 546.
32. Observe the messages transmitted on Link A.

Part I: Relay-forward message (type 12)

33. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
34. The NUT should receive DNS Recursive Name Server address from TN1.
35. TN1 transmits a Relay-forward message to the NUT port 546.
36. Observe the messages transmitted on Link A.

Part J: Relay-reply message (type 13)

37. Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a DNS Recursive Name Server option including TN3's Global address.
38. The NUT should receive DNS Recursive Name Server address from TN1.
39. TN1 transmits a Relay-reply message to the NUT port 546.
40. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT discards the Solicit message from TN1 and does not transmit any packets.
- *Part B*

Step 8: The NUT discards the Request message from TN1 and does not transmit any packets.

- *Part C*

  Step 12: The NUT discards the Confirm message from TN1 and does not transmit any packets.
- *Part D*

  Step 16: The NUT discards the Renew message from TN1 and does not transmit any packets.
- *Part E*

  Step 20: The NUT discards the Rebind message from TN1 and does not transmit any packets.
- *Part F*

  Step 24: The NUT discards the Decline message from TN1 and does not transmit any packets.
- *Part G*

  Step 28: The NUT discards the Release message from TN1 and does not transmit any packets.
- *Part H*

  Step 32: The NUT discards the Information-request message from TN1 and does not transmit any packets.
- *Part I*

  Step 36: The NUT discards the Relay-forward messages from TN1 and does not transmit any packets.
- *Part J*

  Step 40: The NUT discards the Relay-reply messages from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 8: RFC 3736 - Server Specification

Scope

The following tests cover specifications for the server implementation of the Stateless Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request for Comments 3736.
These tests verify the process for receiving a list of available DNS recursive name servers and a domain search list from a server in Stateless Dynamic Host Configuration Protocol for IPv6.

Overview

These tests are designed to verify the readiness of a DHCPv6 server implementation vis-à-vis the Stateless Dynamic Host Configuration Protocol for IPv6 specification (Focus on DNS recursive name servers and Domain search list option).

Test DHCP_CONF.8.1.1: Basic Message Exchange

Purpose: To verify a DHCPv6 server device properly handles the reception of DHCPv6 message during a basic message exchange.

References:

- [DHCP 3315] – Section 5.3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Reply message.

Possible Problems:

- None.

Test DHCP_CONF.8.1.2: Transaction ID Consistency: Basic Exchange

Purpose: To verify a DHCPv6 server device properly uses the same transaction id as the client.

References:

- [DHCP 3315] – Section 15.1
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3
-

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits a valid Information-request message (transaction-id is 100).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmitted a Reply message in response to the Information-request message from TN1 with matching transaction ids (100)

Possible Problems:

- None.

Test DHCP_CONF.8.1.3: Implementation of DHCP constants

Purpose: To verify that the server listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.2
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Valid UDP port

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message to UDP destination port 547.
3. Observe the messages transmitted on Link A.

Part B: Invalid UDP port

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN1 transmits an Information-request message to UDP destination port 33536.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT must transmit a Reply message with a destination UDP port set to 546.
- *Part B*
  Step 6: The NUT should silently ignore the Information-request message from TN and does not send any DHCPv6 messages.

Possible Problems:

- None.

Test DHCP_CONF.8.1.4: Server Message Format

Purpose: To verify that the server transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6, 7, 7.1, 7.2
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Client/Server Message Format

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message to the “All_DHCP_Relay_Agents_and_Servers” multicast address (FF02::1:2).
3. Observe the messages transmitted on Link A.

Part B: Relay Agent/Server Message Format

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN5 transmits a Relay Forward Information-request message from TN3 to the NUT.
6. Observe the messages on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Reply message containing the following elements:
  - The msg-type field was set to the value of 7 (Reply)
  - A header containing a non-zero value Transaction ID
  - A Server Identifier Option (containing a DUID)
  - A Client Identifier Option (containing a DUID)
- *Part B*

  Step 6: The NUT transmits a properly formatted Relay Reply message containing the following elements:
  - The msg-type field was set to the value of 13(Reply-Reply)
  - Hop-count (Copied from the Relay-forward message)
  - Link-address (Copied from the Relay-forward message)
  - Peer-address (Copied from the Relay-forward message)
  - A Relay Message Option

Possible Problems:

- None.

Test DHCP_CONF.8.1.5: Server Identifier Option Format

Purpose: To verify the format of the DHCPv6 Server Identifier option.

References:

- [DHCP 3315] – Section 22.3
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Reply message containing the following Server Identifier option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- DUID Field set to any non-zero number

Possible Problems:

- None.

Test DHCP_CONF.8.1.6: DHCP Unique Identifier (DUID) Contents

Purpose: To verify that the DHCP server transmits the correct DUID contents.

References:

- [DHCP 3315] – Section 9.1, 9.2, 9.3 and 9.4
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: DUID based on Link-layer Address Plus Time [DUID-LLT] Format

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-LLT.
2. TN1 transmits an Information-request message.
3. Observe the messages transmitted on Link A.

Part B: DUID based on Link-layer Address Plus Time [DUID-LLT] Consistency

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-LLT.
5. TN1 transmits an Information-request message.
6. Observe the messages transmitted on Link A.
7. Reboot the NUT
8. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
9. TN1 transmits an Information-request message.
10. Observe the messages transmitted on Link A.

Part C: DUID assigned by vendor based on Enterprise Number [DUID-EN] Format

11. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-EN.
12. TN1 transmits an Information-request message.
13. Observe the messages transmitted on Link A.

Part D: DUID assigned by vendor based on Enterprise Number [DUID-EN] Consistency

14. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-EN.
15. TN1 transmits an Information-request message.
16. Observe the messages transmitted on Link A.
17. Reboot the NUT
18. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
19. TN1 transmits an Information-request message.
20. Observe the messages transmitted on Link A.

Part E: DUID based on Link-layer Address [DUID-LL] Format

21. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-LL.
22. TN1 transmits an Information-request message.
23. Observe the messages transmitted on Link A.

Part F: DUID based on Link-layer Address [DUID-LL] Consistency

24. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT. Configure the type of DUID used by the server to be DUID-LL.
25. TN1 transmits an Information-request message.
26. Observe the messages transmitted on Link A.
27. Reboot the NUT
28. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
29. TN1 transmits an Information-request message.
30. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Reply message containing the following DUID-LLT option:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IANA-assigned value
  - A time value of DUID
  - A Link-layer address
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing the following DUID option values:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IANA-assigned value
  - A time value of DUID
  - A Link-layer address

  Step 10: The NUT transmits a properly formatted Reply message with the same DUID values as transmitted in Step 6.
- *Part C*

  Step 13: The NUT transmits a properly formatted Reply message containing the following DUID option values:
  - An option-code set to OPTION_SERVERID(2)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IANA value
  - A non-zero identifier number value of DUID
- *Part D*

Step 16: The NUT transmits a properly formatted Reply message containing the following DUID option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x02
- An Enterprise Number of DUID, IANA value
- A non-zero identifier number value of DUID

Step 20: The NUT transmits a properly formatted Reply message with the same DUID values as transmitted in Step 16.

- *Part E*

Step 23: The NUT transmits a properly formatted Reply message containing the following DUID option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IANA-assigned value
- A Link-layer address of DUID

- *Part F*

Step 26: The NUT transmits a properly formatted Reply message containing the following DUID option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IANA-assigned value
- A Link-layer address of DUID

Step 30: The NUT transmits a properly formatted Reply message with the same DUID values as transmitted in Step 26.

Possible Problems:

- Either of the following tests is executed according to the DUID type of the server.
  - Server DUID type is DUID-LLT
    Part A and Part B
  - Server DUID type is DUID-EN
    Part C and Part D
  - Server DUID type is DUID-LL
    Part E and Part F

Test DHCP_CONF.8.1.7: DNS Recursive Name Server Option Format

Purpose: To verify the DHCP server transmits the correct DNS Recursive Name Server Option format.

References:

- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message with an Option Request Option (DNS Recursive Name Server Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Reply message containing the following DNS Recursive Name Server option values:

- An option-code set to OPTION_DNS_SERVERS(23)
- An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
- DNS-recursive-name-server set to IPv6 address of DNS recursive name server

Possible Problems:

- None.

Test DHCP_CONF.8.1.8: Domain Search List Option Format

Purpose: To verify the DHCP server transmits the correct Domain Search List Option format.

References:

- [DHCP 3646] – Section 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a Domain Search List option on the NUT.
2. TN1 transmits an Information message with an Option Request Option (Domain Search List Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Reply message containing the following Domain Search List option values:

- An option-code set to OPTION_DOMAIN_LIST(24)
- An option-length set to the length of the 'searchlist' field in octets
- DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.8.1.9: Relay Message Option Format

Purpose: To verify that the DHCP server transmits the correct Relay Message Option format.

References:

- [DHCP 3315] – Section 22.10
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN5 transmits a Relay Forward Information-request message with a Relay Message option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-Reply Reply message containing the following Relay Message option values:

- An option-code set to OPTION_RELAY_MSG(9)
- An option-length set to length of DHCP-relay-message
- A DHCP-relay-message containing Reply message.

Possible Problems:

- None.

Test DHCP_CONF.8.1.10: Interface ID Option Format

Purpose: To verify that the DHCP server transmits the correct Interface ID Option format.

References:

- [DHCP 3315] – Section 22.18
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN5 transmits a Relay Forward Information-request message with an Interface ID option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Steps 4: The NUT transmits a properly formatted Relay- reply Reply message that includes the same Interface ID option transmitted in the Relay-forward message (Step2). And the Interface ID option values:

- An option-code set to OPTION_INTERFACE_ID (18)
- An option-length set to length of interface-id
- A interface-id set to any

Possible Problems:

- None.

Test DHCP_CONF.8.1.11: Configuration of DNS options

Purpose: To verify the DHCP server transmits a message with correctly configured DNS option

References:

- [DHCP 3315] – Section 18.2
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 is configured to provide DNS Recursive Name Server option and DNS Domain Search List Option in parallel with Address Assignment in part A and B. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Returning of DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits an Information message with an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
3. Observe the messages transmitted on Link A.

Part B: Returning of DNS Recursive Name Server option and Domain Search List Option

4. Enable DHCPv6 on the NUT.
5. TN1 transmits an Information message with an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Reply message containing only a DNS Recursive Name Server option.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a DNS Recursive Name Server option and a Domain Search List Option.

Possible Problems:

- None.

Test DHCP_CONF.8.1.12: Creation and Transmission of Reply Messages

Purpose: To verify a server device transmits proper Reply messages.

References:
- [DHCP 3315] – Sections 18.2.5 and 18.2.8
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network according to the Common Topology. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Reply message transmission

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits a valid Information-request message on Link A.
3. Observe the messages transmitted on Link A.

Part B: Reply message in response to Information-request message with ORO (DNS Recursive Name Server option)

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN1 transmits a valid Information-request message with an Option Request Option (DNS Recursive Name Server option) on Link A.
6. Observe the messages transmitted on Link A.

Part C: Reply message in response to Information-request message with ORO (Domain Search List option)

7. Enable DHCPv6 which is configured to provide a Domain Search List option on the NUT.
8. TN1 transmits a valid Information-request message with an Option Request Option (Domain Search List Option) on Link A.
9. Observe the messages transmitted on Link A.

Part D: Relay-Reply message with Reply message (w/o Interface-id Option)

10. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
11. TN5 transmits a valid Relay-forward Information-request message on Link A.
12. Observe the messages transmitted on Link A.

Part E: Relay-Reply message with Reply message (w/ Interface-id Option)

13. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
14. TN5 transmits a valid Relay-forward Information-request message with an Interface-id option on Link A.
15. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Reply message containing the following elements:
    - Destination address set to TN1's unicast address same as the Information-request message's source address
    - A msg-type field set to REPLY (7)
    - A transaction-id set to the same as Information-request message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Information-request message's Client Identifier option
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing the following elements:
    - Destination address set to TN1's unicast address same as the Information-request message's source address
    - A msg-type field set to REPLY(7)
    - A transaction-id set to the same as the Information-request message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Information-request message's Client Identifier option
    - A DNS Recursive Name Server option set to the following values:
        - An option-code set to OPTION_DNS_SERVERS(23)
        - An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
        - DNS-recursive-name-server set to IPv6 address of DNS recursive name server
- *Part C*

  Step 9: The NUT transmits a properly formatted Reply message containing the following elements:
    - Destination address set to TN1's unicast address same as the Information-request message's source address
    - A msg-type field set to REPLY(7)
    - A transaction-id set to the same as the Information-request message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Information-request message's Client Identifier option
    - A Domain Search List option set to the following values::
        - An option-code set to OPTION_DOMAIN_LIST(24)
        - An option-length set to the length of the 'searchlist' field in octets
        - DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List
- *Part D*

  Step 12: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address.
- *Part E*

Step 15: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.

Possible Problems:

- None.

Test DHCP_CONF.8.1.13: Creation and Transmission of Relay-Reply messages

Purpose: To verify a server device transmits proper Relay-Reply messages.

References:

- [DHCP 3315] – Section 20.3
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-Reply message transmission

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN5 transmits a valid Relay-forward Information-request message on Link A.
3. Observe the messages transmitted on Link A.

Part B: Relay-Reply message transmission through the same Relay agents

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN5 transmits a Relay-forward Information-request message from TN3 on Link A.
6. Observe the messages transmitted on Link A.
7. TN6 transmits a Relay-forward Information-request message from TN3 on Link A.
8. Observe the messages transmitted on Link A.

Part C: Relay-Reply message transmission through the layered Relay agents

9. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
10. TN4 transmits a Information-request message on Link C. TN7 transmits a Relay-forward Information-request message from TN4 on Link B. TN5 transmits a valid Relay-forward Information-request message from TN7 on Link A.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:

  - Destination address set to TN5's unicast address same as the Relay-forward message's source address
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to the same as Relay-forward Information-request message's hop-count
  - A link-address set to the same as Relay-forward Information-request message's link-address

- A peer-address set to the same as Relay-forward Information-request message's peer-address
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to a Reply message
    - A Reply message containing the following elements:
        - A Server Identifier option (containing a DUID)
        - A Client Identifier option set to the same as Relay-forward Information-request message's Client Identifier option (If the Relay-forward Information-request includes a Client Identifier option)
        - A DNS Recursive Name Server option
- *Part B*

  Step 6: The NUT transmits a Relay-Reply Reply message to TN5.
  Step 8: The NUT transmits a Relay-Reply Reply message to TN6.
- *Part C*

  Step 11: The NUT transmits a properly formatted Reply-Reply Reply message containing the following elements:
    - A msg-type set to RELAY-REPLY (13)
    - A hop-count set to 1
    - A link-address set to zero
    - A peer-address set to TN7's Global or Link Local Address on Link C.
    - A DHCP-relay-message set to a Relay Message Option:
        - A msg-type set to RELAY-REPLY (13)
        - A hop-count set to 0
        - A link-address set to TN7's Global Address on Link D.
        - Peer-address set to TN4's Link Local Address
        - A DHCP-relay-message set to an Reply message

Possible Problems:

- None.

Test DHCP_CONF.8.1.14: Reception of Invalid Information-request message

Purpose: To verify a server device properly handles the reception of invalid Information-request messages.

References:
- [DHCP 3315] – Sections 15 and 15.12
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Reception of Information-request message via unicast
1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Information-request message with unicast destination address to NUT.
3. Observe the messages transmitted on Link A.

Part B: Contains Server Identifier option

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN1 transmits an Information-request message that contains a Server Identifier option.
6. Observe the messages transmitted on Link A.

Part C: Contains IA_NA option

7. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
8. TN1 transmits an Information-request message that contains an IA_NA option.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT must silently discard the Information-request message. The NUT must not send a Reply message based on the received Information-request message.
- *Part B*
  Step 6: The NUT must silently discard the Information-request message. The NUT must not send a Reply message based on the received Information-request message.
- *Part C*
  Step 9: The NUT must silently discard the Information-request message. The NUT must not send a Reply message based on the received Information-request message.

Possible Problems:

- None.

Test DHCP_CONF.8.1.15: Server Message Validation

Purpose: To verify a server device properly discards all Advertise, Reply and Relay-reply messages.

References:

- [DHCP 3315] – Sections 15.3, 15.10 and 15.14
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Advertise message (type 2)

1. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
2. TN1 transmits an Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
3. Observe the messages transmitted on Link A.

Part B: Reply message (type 7)

4. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
5. TN1 transmits a Reply message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
6. Observe the messages transmitted on Link A.

Part C: Relay-reply message (type 13)

7. Enable DHCPv6 which is configured to provide a DNS Recursive Name Server option on the NUT.
8. TN1 transmits a Relay Reply Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT discards the Advertise message from TN1 and does not transmit any packets.
- *Part B*
  Step 6: The NUT discards the Reply message from TN1 and does not transmit any packets.
- *Part C*
  Step 9: The NUT discards the Relay Reply message from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 9: RFC 3736 - Relay Agent Specification

Scope

The following tests cover specifications for the Relay agent implementation of the Stateless Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request for Comments 3736.
These tests verify the process for receiving a list of available DNS recursive name servers and a domain search list from a server in Stateless Dynamic Host Configuration Protocol for IPv6.

Overview

These tests are designed to verify the readiness of a DHCPv6 relay agent implementation vis-à-vis the Stateless Dynamic Host Configuration Protocol for IPv6 specification (Focus on DNS recursive name servers and Domain search list option).

Test DHCP_CONF.9.1.1: Basic Message Exchanges

Purpose: To verify that the Relay agent device properly handles the reception of DHCPv6 messages during a basic message exchange.

References:

- [DHCP 3315] – Section 5.3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits an Information-request including an Option Request Option (DNS Recursive Name Server option) message.
3. Observe the messages transmitted on Link A.
4. Upon reception of a Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message from the NUT, TN2 transmits a Relay-reply Reply message.
5. Observe the messages transmitted on Link B.

Observable Results:

Step 3: The NUT must transmit a Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message.
Step 5: The NUT must process the correct Relay-reply Reply message and transmit a Reply message to TN1.

Possible Problems:

- None.

Test DHCP_CONF.9.1.2: Implementation of DHCP constants

Purpose: To verify that the Relay agent listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.1, 5.2 and 20
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

Part A: Multicast Address and Hop Limit

1. Enable DHCPv6 on the NUT.
2. TN1 transmits an Information-request including an Option Request Option (DNS Recursive Name Server option) message on Link B.
3. Observe the messages transmitted on Link A.

Part B: Valid UDP port

4. Enable DHCPv6 on the NUT.
5. TN1 transmits an Information-request message to UDP destination port 547.
6. Observe the messages transmitted on Link A.
7. Upon reception of a Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message from the NUT, TN2 transmits a Relay-reply Reply message to UDP port 547.
8. Observe the messages transmitted on Link B.

Part C: Invalid UDP port

9. Enable DHCPv6 on the NUT.
10. TN1 transmits an Information-request including an Option Request Option (DNS Recursive Name Server option) message to UDP destination port 33536.
11. Observe the messages transmitted on Link A and B.

Observable Results:

- *Part A*

  Step 3: The NUT must transmit a Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message with a destination address set to the “All_DHCP_Servers” multicast address (FF05::1:3) and a Hop Limit set to 32.
- *Part B*

  Step 6: The NUT must transmit a Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message with a destination UDP port set to 547.

Step 8: The NUT must process the correct Relay-reply Reply message and transmit a Reply message to TN1.

- *Part C*

  Step 11: The NUT should silently ignore the Information-request including an Option Request Option (DNS Recursive Name Server option) message from TN and does not send any DHCPv6 messages.

Possible Problems:

- None.

Test DHCP_CONF.9.1.3: Relay Agent Message Format

Purpose: To verify that the Relay agent transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 7, 7.1 and 7.2
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits an Information-request including an Option Request Option (DNS Recursive Name Server option) message on Link B.
3. Observe the messages on Link A.

Observable Results:

Step 6: The NUT transmits a properly formatted Relay-forward message containing the following elements:

- The msg-type field was set to the value of 12(Reply-forward)
- Hop-count field was set to 0
- Link-address field was set to the address of Relay agent interface for Link B
- Peer-address (Copied from the Information-request message)
- A Relay Message Option

Possible Problems:

- None.

Test DHCP_CONF.9.1.4: Relay Message Option Format

Purpose: To verify that the DHCP relay agent transmits the correct Relay Message Option format.

References:

- [DHCP 3315] – Section 22.10
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the relay agent device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits an Information-request including an Option Request Option (DNS Recursive Name Server option) message on Link B
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-forward Information-request including an Option Request Option (DNS Recursive Name Server option) message containing the following Relay Message option values:

- An option-code set to OPTION_RELAY_MSG(9)
- An option-length set to length of DHCP-relay-message
- A DHCP-relay-message containing Information-request message.

Possible Problems:

- None.

Test DHCP_CONF.9.1.5: Relay and Transmission of Reply Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Reply messages for DNS Configuration options.

References:
- [DHCP 3315] – Sections 20.2 and 20.3
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Reply message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link B.
3. After the reception of a Relay-forward Information-request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
4. Observe the messages transmitted on Link B.

Part B: Relay-Reply Reply message transmission through the layered Relay agents for DNS Recursive Name Server option

5. Enable DHCPv6 on the NUT.
6. TN3 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link C.
7. TN4 transmits a valid Relay-forward Information-request message to the NUT.
8. After the reception of a Relay-forward Information-request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
9. Observe the messages transmitted on Link B.

Part C: Reply message transmission for DNS Domain Search List option

10. Enable DHCPv6 on the NUT.
11. TN1 transmits a valid Information-request message including an Option Request Option (DNS Domain Search List option) on Link B.
12. After the reception of a Relay-forward Information-request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.
13. Observe the messages transmitted on Link B.

Part D: Relay-Reply Reply message transmission through the layered Relay agents for DNS Domain Search List option

14. Enable DHCPv6 on the NUT.
15. TN3 transmits a valid Information-request message including an Option Request Option (DNS Domain Search List option) on Link C.
16. TN4 transmits a valid Relay-forward Information-request message to the NUT.
17. After the reception of a Relay-forward Information-request message from the NUT on Link A, the TN2 transmits a valid Relay-Reply Reply message to the NUT.

18. Observe the messages transmitted on Link B.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing the following elements:
  - Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Reply message
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A Server Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A Client Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
  - A DNS Recursive Name Server option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
- *Part B*

  Step 9: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:
  - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Reply message from TN2
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to 0
  - A link-address set to the same as Relay-Reply Reply message's link-address in Relay Message option
  - A peer-address set to the same as Relay-Reply Reply message's peer-address in Relay Message option
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Reply message
    - A Reply message containing the following elements:
      - A transaction-id set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - A Server Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - A Client Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
      - A DNS Recursive Name Server option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
- *Part C*

  Step 13: The NUT transmits a properly formatted Reply message containing the following elements:

- Destination address set to TN1's unicast address same as the peer-address field of the Relay-Reply Reply message
    - A msg-type field set to REPLY(7)
    - A transaction-id set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A Server Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A Client Identifier option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
    - A DNS Domain Search List option set to the same as the Reply message's one in Relay Message option of the Relay-Reply Reply message
- *Part D*

  Step 17: The NUT transmits a properly formatted Relay-Reply Reply message containing the following elements:
    - Destination address set to TN4's unicast address same as the peer-address field of the Relay-Reply Reply message from TN2
    - A msg-type field set to RELAY-REPL(13)
    - A hop-count set to 0
    - A link-address set to the same as Relay-Reply Reply message's link-address in Relay Message option
    - A peer-address set to the same as Relay-Reply Reply message's peer-address in Relay Message option
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Reply message
        - A Reply message containing the following elements:
            - A transaction-id set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
            - A Server Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
            - A Client Identifier option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2
            - A DNS Domain Search List option set to the same as the Relay-reply Reply message's one in Reply Message option from TN2

Possible Problems:

- None.

Test DHCP_CONF.9.1.6: Relay and Transmission of Relay-forward Information-request Messages for DNS Configuration options

Purpose: To verify a relay agent device relays and transmits Information-request messages for DNS Configuration options.

References:

- [DHCP 3315] – Sections 20.1, 20.1.1 and 20.1.2
- [DHCP 3646] – Section 3 and 4
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Relay-forward Information-request message transmission for DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link B.
3. Observe the messages transmitted on Link A.

Part B: Relay-forward Information-request message transmission through the layered Relay agents for DNS Recursive Name Server option(w/o Interface-ID Option)

4. Enable DHCPv6 on the NUT.
5. TN3 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link C.
6. TN4 transmits a valid Relay-forward Information-request message to the NUT.
7. Observe the messages transmitted on Link A.

Part C: Relay-forward Information-request message transmission through the layered Relay agents for DNS Recursive Name Server option(w Interface-ID Option)

8. Enable DHCPv6 on the NUT.
9. TN3 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link C.
10. TN4 transmits a valid Relay-forward Information-request message to the NUT.
11. Observe the messages transmitted on Link A.

Part D: Relay-forward Information-request message transmission for DNS Domain Search List option

12. Enable DHCPv6 on the NUT.
13. TN1 transmits a valid Information-request message including an Option Request Option DNS Domain Search List option) on Link B.
14. Observe the messages transmitted on Link A.

Part E: Relay-forward Information-request message transmission through the layered Relay agents for DNS Domain Search List option(w/o Interface-ID Option)

15. Enable DHCPv6 on the NUT.
16. TN3 transmits a valid Information-request message including an Option Request Option DNS Domain Search List option) option on Link C.
17. TN4 transmits a valid Relay-forward Information-request message to the NUT.

18. Observe the messages transmitted on Link A.

Part F: Relay-forward Information-request message transmission through the layered Relay agents for DNS Domain Search List option(w Interface-ID Option)

19. Enable DHCPv6 on the NUT.
20. TN3 transmits a valid Information-request message including an Option Request Option DNS Domain Search List option) option on Link C.
21. TN4 transmits a valid Relay-forward Information-request message to the NUT.
22. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Information-request message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Information-request message
    - A Information-request message containing the following elements:
      - A meg-type set to the value of 11 (Information-request)
      - A transaction-id set to the same as the Information-request message's transaction-id
      - A Client Identifier option set to the same as the Information-request message's Client Identifier option
      - An Option Request option(DNS Recursive Name Server option) set to the same as the Information-request message's Option Request option(DNS Recursive Name Server option)
- *Part B*

  Step 7: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Information-request message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field

- A DHCP-relay-message set to an Relay-forward message
- The Relay-forward message set to same as the received Relay-forward Information-request message

- *Part C*

  Step 11: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 1
  - An Interface-ID option
  - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT's global address on Link B)
  - A peer-address set to the same as the Relay-forward Information-request message(Step9)'s source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Information-request message
- *Part D*

  Step 14: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:
  - Destination address set to "All_DHCP_Servers" multicast address (FF05::1:3)
  - A msg-type field set to RELAY-FORW(12)
  - A hop-count set to 0
  - A link-address set to a global address with a prefix assigned to the Link B (NUT's global address on Link B)
  - A peer-address set to the same as the Information-request message's source address
  - A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Information-request message
    - A Information-request message containing the following elements:
      - A meg-type set to the value of 11 (Information-request)
      - A transaction-id set to the same as the Information-request message's transaction-id
      - A Client Identifier option set to the same as the Information-request message's Client Identifier option
      - An Option Request option(DNS Domain Search List option) set to the same as the Information-request message's Option Request option(DNS Domain Search List option)
- *Part E*

  Step 18: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:

- Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)
- A msg-type field set to RELAY-FORW(12)
- A hop-count set to 1
- A link-address set to 0 or global address assigned to the interface on which the message was received (NUT’s global address on Link B)
- A peer-address set to the same as the Relay-forward Solicit message(Step19)’s source address
- A Relay Message option with following values:
    - An option-code set to OPTION_RELAY_MSG (9)
    - An option-length set to length of DHCP-relay-message field
    - A DHCP-relay-message set to an Relay-forward message
    - The Relay-forward message set to same as the received Relay-forward Information-request message

- *Part F*

  Step 22: The NUT transmits a properly formatted Relay-forward Information-request message containing the following elements:
    - Destination address set to “All_DHCP_Servers” multicast address (FF05::1:3)
    - A msg-type field set to RELAY-FORW(12)
    - A hop-count set to 1
    - An Interface-ID option
    - A link-address set to 0 or global address assigned to the interface on which the message was received (NUT’s global address on Link B)
    - A peer-address set to the same as the Relay-forward Solicit message(Step19)’s source address
    - A Relay Message option with following values:
        - An option-code set to OPTION_RELAY_MSG (9)
        - An option-length set to length of DHCP-relay-message field
        - A DHCP-relay-message set to an Relay-forward message
        - The Relay-forward message set to same as the received Relay-forward Information-request message

Possible Problems:

- None.

Test DHCP_CONF.9.1.7: Reception of Invalid Relay-forward Messages

Purpose: To verify a relay agent device properly handles the reception of invalid Relay-forward messages.

References:

- [DHCP 3315] – Sections 20.1.2
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN3 transmits a valid Information-request message including an Option Request Option (DNS Recursive Name Server option) on Link C.
3. TN4 transmits a Relay-forward Information-request message which hop-count set to HOP_COUNT_LIMIT (32) to the NUT.
4. Observe the messages transmitted on Link A.

Observable Results:

Step 4: The NUT must silently discard the Relay-forward Information-request message. The NUT must not send a Relay-forward message based on the received Relay-forward Information-request message.

Possible Problems:

- None.

Test DHCP_CONF.9.1.8: Relay Agent Message Validation

Purpose: To verify a relay agent device properly discards all Advertise and Reply messages.

References:

- [DHCP 3315] – Sections 15.3, 15.10 and 15.11
- [DHCP 3646] – Section 3
- [DHCP 3736] – Section 5.1, 5.2 and 5.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 on the relay agent device is disabled after each part.

Procedure:

Part A: Advertise message (type 2)

1. TN2 transmits an Advertise message to the NUT port 547.
2. Observe the messages transmitted on Link A and B.

Part B: Reply message (type 7)

3. TN2 transmits a Reply message to the NUT port 547.
4. Observe the messages transmitted on Link A and B.

Observable Results:

- *Part A*
  Step 2: The NUT discards the Advertise message from TN1 and does not transmit any packets.
- *Part B*
  Step 4: The NUT discards the Reply message from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 10: RFC 3633 – Requesting Router (Client) Specification

Scope

The following tests cover specifications for the requesting router (Client) implementation of IPv6 Prefix options for Dynamic Host Configuration Protocol (DHCP) version 6, Request For Comments 3633.
These tests verify the process for receiving a list of available IPv6 Prefix options from a server in Dynamic Host Configuration Protocol for IPv6.

Overview

These tests are designed to verify the readiness of a DHCPv6 requesting router (Client) implementation vis-à-vis the IPv6 Prefix options for Dynamic Host Configuration Protocol for IPv6 specification.

Group 1: Client Basic Behaviors, Constants and Format

Scope

The following tests focus on the DHCP Basic behaviors, constants and format. The messages that are sent by the client will locate servers that will assign the IPv6 `prefixes` and/or additional configuration information pertaining to client IAs. Tests in this section are focused on client devices.

Test DHCP_CONF.10.1.1: Prefix Options Format

Purpose: To verify that the requesting router transmits the correct prefix options format.

References:

- [DHCP 3633] –Section 6, 9 and 10

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: IA_PD Option Format

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Server identifier Option Format

3. Enable DHCPv6 on the NUT.
4. Observe the messages transmitted on Link A.
5. Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message including a Server Identifier Option.
6. Observe the messages transmitted on Link A.

Part C: IA_PD Prefix Option Format

7. Enable DHCPv6 on the NUT
8. Upon reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message including an IA_PD option with a Prefix option.
9. Observe the messages transmitted on Link A.

Part D: IAID Consistency

10. Enable DHCPv6 on the NUT
11. Observe the messages transmitted on Link A.
12. Reboot NUT
13. Enable DHCPv6 on the NUT
14. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 2: The NUT transmits a properly formatted Solicit message containing the following IA_PD option values:
    - An option-code set to OPTION_IA_PD (25)
    - An option-length set to 12 + length of IA_PD options field
    - An IAID value set to a number
    - Time T1 set to a number
    - Time T2 set to a number

- *Part B*
  Step 4: The NUT transmits a properly formatted Solicit message.

Step 6: The NUT transmits a properly formatted Request message containing the following Server Identifier option values:

- An option-code set to OPTION_SERVERID (2)
- An option-length set to length of DUID in octets
- DUID Field set to DUID for the Server

- *Part C*

  Step 9: The NUT transmits a properly formatted Request message containing the following IA_PD option values:

  - An option-code set to OPTION_IA_PD (25)
  - An option-length set to 12 + length of IA_PD options field
  - An IAID value set to a number
  - Time T1 set to a number
  - Time T2 set to a number
  - An IA_PD Prefix Option containing the following values:
  - An option-code set to OPTION_IAPREFIX (26)
  - An option-length set to 25 + length of Prefix options field
  - A preferred lifetime and a valid lifetime
  - A valid prefix length
  - An IPv6 Prefix

- *Part D*

  Step 11: The NUT transmits a properly formatted Solicit message containing an IA_PD option.
  Step 14: The NUT transmits a properly formatted Solicit message containing an IA_PD with the same IAID as in step 7.

Possible Problems:

- None

Test DHCP_CONF.10.1.2: Basic Message Exchange

Purpose: To verify a DHCP requesting router device properly handles the reception of Reply messages during a basic message exchange.

References:

- [DHCP 3633] – Sections 7,9 and 12

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the requesting router device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Valid Reply message in response to Request.

1. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
2. Observe the messages transmitted on Link A and Link B.
3. Upon reception of a Renew message from the NUT at time T1.
4. Observe the messages transmitted on Link A and Link B.

Part B: Valid Reply message in response to a Renew message.

5. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
6. The NUT should have received IPv6 prefix information from TR1. TR1 assigns the T1 and T2 parameters to the NUT's IA.
7. Upon reception of a Renew message from the NUT at time T1, TR1 transmits a properly formatted Reply message.
8. Observe the messages transmitted on Link A and Link B.
9. After another T1 time elapse, NUT transmits a Renew message.
10. Observe the messages transmitted on Link A and Link B.

Part C: Valid Reply message in response to a Rebind message.

11. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
12. The NUT should have received IPv6 address information from TR1. TR1 assigns the T1 and T2 parameters to the NUT's IA.
13. Upon reception of a Rebind message from the NUT at time T2, TR1 transmits a properly formatted Reply message.
14. Observe the messages transmitted on Link A and Link B.
15. After another T1 time elapse, NUT transmits a Renew message.
16. Observe the messages transmitted on Link A and Link B.

Part D: Valid Reply message in response to a Release message.

17. Enabled dhcpv6 in NUT.
18. The NUT should have received IPv6 address information from TR1.
19. Configure NUT to release the IPv6 prefix.
20. Upon reception of the NUT's Release message, TR1 transmits a properly formatted Reply message to the NUT.
21. Observe the messages transmitted on Link A and Link B.

Observable Results:

- *Part A*
  Step 2: The NUT should transmit a valid Request Message and TR1 transmit a valid Reply Message.
  Step 4: The NUT should send a valid Renew Message with the same prefix in the Reply message in step2.
- *Part B*
  Step 8: The NUT should send a valid Renew Message and TR1 transmit a valid Reply Message.
  Step 10: The NUT should send a valid Renew Message with the same prefix in the Reply message in step7.
- *Part C*
  Step 14: The NUT should send a valid Rebind Message and TR1 transmit a valid Reply.
  Step 16: The NUT should send a valid Renew Message with the same prefix in the Reply message in step13**.**
- *Part D*
  Step 19: The NUT should send a valid Release Message and TR1 transmit a valid Reply.

Possible Problems:

- None.

Test DHCP_CONF.10.1.3: Implementation of DHCP constants

Purpose: To verify that the requesting router listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.1, 5.2 and 13
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the requesting router device after each part.

Procedure:

Part A: Multicast Addresses

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Valid UDP port

3. Enable DHCPv6 on the NUT.
4. Observe the messages transmitted on Link A.
5. Upon reception of a Solicit message from the NUT, TN1 transmits an Advertise message to UDP port 546.
6. Observe the messages transmitted on Link A.

Part C: Invalid UDP port

7. Enable DHCPv6 on the NUT.
8. Upon reception of a Solicit message from the NUT, TN1 transmits an Advertise message to UDP destination port 33536.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 1: The NUT must transmit a Solicit message with a destination address set to the "ALL_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
- *Part B*

  Step 4: The NUT must transmit a Solicit message with a destination UDP port set to 547.
  Step 6: The NUT must process the correct Advertise message and transmit a Request Message to TN1.
- *Part C*

  Step 9: The NUT should send a Destination Unreachable message to TN1 link-local address. The source address of the packet must be the NUT's unicast address. The code field must be set to "4" port unreachable and the invoking advertise packet included in the Error Message must not exceed minimum IPv6 MTU.

Possible Problems:

- None.

Test DHCP_CONF.10.1.4: Client Message Format

Purpose: To verify that the requesting router transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6 and 16

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the requesting router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following elements:

- Source Address set to Link-Local
- The msg-type field was set to the value of 1 (Solicit)
- A header containing a non-zero value Transaction ID

Possible Problems:

- None.

Test DHCP_CONF.10.1.5: Client Identifier Option Format

Purpose: To verify that the DHCP requesting router transmits the correct Client Identifier Option format.

References:

- [DHCP 3315] – Section 22.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the requesting router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmits a properly formatted Solicit message containing the following Client Identifier option values:

- An option-code set to OPTION_CLIENTID (1)
- An option-length set to length of DUID in octets
- DUID Field set to any non-zero number

Possible Problems:

- None.

Test DHCP_CONF.10.1.6: Client DHCP Unique Identifier Contents

Purpose: To verify the format of the DHCP requesting router's DUID-LLT, DUID-EN and DUID-LL option.

References:

- [DHCP 3315] – Sections 9.2, 9.3 and 9.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the requesting router device after each part.

Procedure:

Part A: DUID-LLT Format

1. Enable DHCPv6 on the NUT.
2. Observe the messages transmitted on Link A.

Part B: DUID-LLT Consistency

3. Enable DHCPv6 on the NUT.
4. Observe the messages transmitted on Link A.
5. Reboot the NUT.
6. Enable DHCPv6 on the NUT.
7. Observe the messages transmitted on Link A.

Part C: DUID-EN Format

8. Enable DHCPv6 on the NUT.
9. Observe the messages transmitted on Link A.

Part D: DUID-EN Consistency

10. Enable DHCPv6 on the NUT.
11. Observe the messages transmitted on Link A.
12. Reboot the NUT.
13. Enable DHCPv6 on the NUT.
14. Observe the messages transmitted on Link A.

Part E: DUID-LL Format

15. Enable DHCPv6 on the NUT.
16. Observe the messages transmitted on Link A.

Part F: DUID-LL Consistency

17. Enable DHCPv6 on the NUT.
18. Observe the messages transmitted on Link A.
19. Reboot the NUT.
20. Enable DHCPv6 on the NUT.
21. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following DUID-LLT option:

- An option-code set to OPTION_CLIENTID(1)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x01
- A hardware type set to the IAPD-assigned value
- A time value of DUID
- A link-layer address

- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing the following DUID-LLT option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x01
  - A hardware type set to the IAPD-assigned value
  - A time value of DUID
  - A link-layer address

  Step 7: The NUT must transmit a Solicit message with the DUID-LLT option containing the same values as in Step 4.
- *Part C*

  Step 9: The NUT transmits a properly formatted Solicit message containing the following DUID-EN option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IAPD value
  - A non-zero identifier number of the DUID
- *Part D*

  Step 11: The NUT transmits a properly formatted Solicit message containing the following DUID-EN option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x02
  - An Enterprise Number of DUID, IAPD value
  - A non-zero identifier number of the DUID

  Step 14: The NUT must transmit a Solicit message with the DUID-EN option containing the same values as in Step 11.
- *Part E*

  Step 16: The NUT transmits a properly formatted Solicit message containing the following DUID-LL option:
  - An option-code set to OPTION_CLIENTID(1)
  - An option-length set to the length of DUID in octets
  - The type field was set to the value of 0x03
  - A hardware type set to the IAPD-assigned value
  - A link-layer address of DUID
- *Part F*

Step 18: The NUT transmits a properly formatted Solicit message containing the following DUID-LL option:

- An option-code set to OPTION_CLIENTID(1)
- An option-length set to the length of DUID in octets
- The type field was set to the value of 0x03
- A hardware type set to the IAPD-assigned value
- A link-layer address of DUID

Step 21: The NUT must transmit a Solicit message with the DUID-LL option containing the same values as in Step18.

Possible Problems:

- Either of the following tests is executed according to the DUID type of the client.

  - Client DUID type is DUID-LLT
    Part A and Part B
  - Client DUID type is DUID-EN
    Part C and Part D
  - Client DUID type is DUID-LL
    Part E and Part F

Test DHCP_CONF.10.1.7: Elapsed Time Option Format

Purpose: To verify that the DHCP requesting router transmits the correct Elapsed Time Option format.

References:

- [DHCP 3315] – Section 22.9

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the requesting router device after each part.

Procedure:

Part A: Elapsed Time Option in Solicit message for Prefix Delegation

1. Enable DHCPv6 on the NUT.
2. Observe the First Solicit message transmitted on Link A.

Part B: Elapsed Time Option in Request message

3. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
4. Observe the first Request message transmitted on Link A.

Part C: Elapsed Time Option in Renew message for Prefix Delegation

5. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
6. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA.
7. After time T1, observe the message transmitted on Link A.

Part D: Elapsed Time Option in Rebind message for Prefix Delegation

8. Common Test Setup 1.1 is performed with T1=50s and T2=80s.
9. TN1 does not respond to any Renew messages transmitted after T1.
10. After time T2, observe the messages transmitted on Link A.

Part E: Elapsed Time Option in Release message for Prefix Delegation

11. Common Test Setup 1.1 is performed before each part.
12. Verify that the NUT is configured with the received IPv6 prefix information from TR1.
13. Configure the client to release the IPv6 prefix.
14. Observe the messages transmitted on Link A.

Part F: Maximum Elapsed Time in elapsed-time field

15. Common Test Setup 1.1 is performed before each part with the values T1=50s and T2=2500s (preferred lifetime and valid lifetime are greater than T1 and T2).
16. The NUT should have received IPv6 address information from TN1 in Step 6. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 2500s).
17. After time T1, observe the messages transmitted on Link A until 8 Renew messages received or 1256 (0xffff + REN_MAX_RT) seconds elapsed since the first Renew message was received.

Observable Results:

- *Part A*

  Step 2: The NUT transmits properly formatted Solicit messages containing the following Elapsed Time option values:

- An option-code set to OPTION_ELAPSED_TIME (8)
- An option-length set to 2
- An elapsed time set to a number

- *Part B*
  Step 4: The NUT transmits properly formatted Request messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part C*
  Step 11: The NUT transmits properly formatted Renew messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part D*
  Step 14: The NUT transmits properly formatted Rebind messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part E*
  Step 18: The NUT transmits properly formatted Release messages containing the following Elapsed Time option values:
  - An option-code set to OPTION_ELAPSED_TIME (8)
  - An option-length set to 2
  - An elapsed time set to a number

- *Part F*
  Step 24: The NUT transmitted a first Renew message containing an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Renew messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Renew message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Renew message was received.

Possible Problems:

- None.

Group 2: Client Message Transmission

Scope

The following tests focus on the Requesting router (Client) message creation, transmission and termination of DHCP IPv6 exchanges. The messages that are sent by the client will locate servers that will assign the IPv6 prefixes and/or additional configuration information pertaining to client IAs. Tests in this section are focused on client devices.

Test DHCP_CONF.10.2.1: Transmission of Solicit Messages for Prefix Delegation

Purpose: To verify a requesting router device transmits properly formatted Solicit messages for Prefix Delegation.

References:

- [DHCP 3633] – Sections 6,7 and 11.1
- [DHCP 3315] – Sections 5.5, 14, 15.1, 16, 17.1, 17.1.1 and 17.1.2

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Solicit message format

1. Enable DHCPv6 on the NUT.
2. Observe the first Solicit message transmitted on Link A.

Part B: Reliability of DHCPv6 Retransmission

3. Enable DHCPv6 on the NUT.
4. Observe the first Solicit message transmitted on Link A.
5. Wait for second Solicit message.
6. Observe the second Solicit message transmitted on Link A.

Part C: Retransmission of Solicit Message

7. Enable DHCPv6 on the NUT.
8. Observe the time the first Solicit message was transmitted on Link A.
9. Wait for second Solicit message.
10. Observe the time the second Solicit message was transmitted on Link A.

Part D: Maximum Retransmission Time of Solicit Message

11. Enable DHCPv6 on the NUT.
12. Continue to capture Solicit messages until RTprev= MRT + MRT*RAND (108 <= RTprev <=132).
13. Observe the messages transmitted on Link A.
14. Continue to capture Solicit messages until 776(0xffff+SOL_MAX_RT) seconds elapsed since the first Solicit message was received.
    15. Observe the Elapsed Time Option in Solicit message transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following elements:
    - Src Address is a link-local for that interface
    - The msg-type field was set to the value of 1 (Solicit)
    - A header containing a Transaction ID
    - A Client Identifier Option (containing DUID)

- An Elapsed Time Option

- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing the following elements:
  - Src Address is a link-local for that interface
  - The msg-type field was set to the value of 1 (Solicit)
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - An Elapsed Time Option

  Step 6: The NUT transmits a properly formatted Solicit message with the same values as in Step 4. The transaction ID is the same for all retransmitted messages.

- *Part C*

  Step 8: The NUT transmits a properly formatted Solicit message.

  Step 10: The NUT transmits a properly formatted Solicit message according to the Second message in the chart below.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 1.0)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1) = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part D*

  Step 13: The NUT should properly transmit Solicit messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Solicit Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	RT (greater than 1.0 sec)= IRT + RAND*IRT Where IRT=1, RAND>0	RT(1.1 sec) = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120
X+1 message	108 seconds =.9*MRT where MRT=120	132 seconds =1.1*MRT where MRT=120

Step 15: The first Solicit message containing an Elapsed Time option with its elapsed-time value set to 0, and the followed Solicit messages' elapsed-time value set to the time elapsed since the first Solicit message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Solicit message was received. The elapsed-time value of these Solicit messages should be in the range of the follow chat:

Solicit message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0

Second message	Value=1000ms =IRT+RAND*IRT Where IRT=1s, RAND=0	Value=1100ms = IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2900ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff
| |	Value=0xffff	Value=0xffff

Possible Problems:

None.

Test DHCP_CONF.10.2.2: Message Exchange Termination for Solicit messages

Purpose: To verify that a DHCPv6 requesting router device properly implements the mechanism for message exchange termination for Solicit messages.

References:

- [DHCP 3315] – Sections 14 and 17.1.2

Test Setup: Connect the network according to the Common Topology. DHCPv6 is enabled on the requesting router device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Receives Advertise message without Preference Option before first RT elapse

1. Enable DHCPv6 on the NUT.
2. Wait until the NUT transmits a Solicit message.
3. TN1 immediately transmits an Advertise message that does not include a Preference Option.
4. Observe the messages transmitted on Link A.

Part B: Receives Advertise message without Preference Option after first RT elapse

5. Enable DHCPv6 on the NUT
6. Wait until the NUT transmits a second Solicit message.
7. TN1 transmits an Advertise message that does not include a Preference Option.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 4: The NUT must wait IRT + RAND*IRT (greater than 1.0) seconds before transmitting a Request message. The NUT must not transmit a Request message immediately after receiving the Advertise message from the Server.
- *Part B*
  Step 8: The NUT must transmit a Request message immediately after receiving the Advertise message from the Server.

Possible Problems:

- If the NUT is configured with either MRC or MRD set to a value other than 0, the NUT will terminate the message exchange according to section 14 of RFC 3315; therefore the above test cases would not apply.

Test DHCP_CONF.10.2.3: Transmission of Request Messages for Prefix Delegation

Purpose: To verify a requesting router device transmits properly formatted Request messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 7 and 12.1
- [DHCP 3315] – Sections 5.5, 14 and 18.1.1

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Request message format

1. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
2. Observe the messages transmitted on Link A.

Part B: Retransmission of Request messages

3. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
4. Observe the messages transmitted on Link A until second Request message received.

Part C: Maximum Retransmission Time of Request messages

5. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
6. Continue to capture Request messages until RTprev= MRT + MRT*RAND (27 <= RTprev <=33).
7. Observe the messages transmitted on Link A.

Part D: Maximum Retransmission Count of Request messages

8. Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
9. Continuously observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Request message to TN1 containing:
  - The msg-type field was set to the value of 3 (Request)
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - A Server Identifier Option (containing a DUID)
  - An Elapsed Time Option
- *Part B*

  Step 4: The NUT transmits a properly formatted Request message according to the Second message in the chart below.

Request Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 = IRT + RAND*IRT Where IRT=1, RAND=-.1	1.1 = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part C*

  Step 7: The NUT should properly transmit Request messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Request Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	27 seconds =.9*MRT where MRT=30	33 seconds =1.1*MRT where MRT=30
X+1 message	27 seconds =.9*MRT where MRT=30	33 seconds =1.1*MRT where MRT=30

- *Part D*

  Step 9: The NUT must terminate the message exchange after the transmission of REQ_MAX_RC (10) Request messages. The NUT must not transmit any more Request messages.

  The elapsed-time value of these Request messages should be in the range of the follow chat:

Request message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms=RT+0 RT=IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms=RT+0 RT= IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms=Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
10th message	Value>Valueprev	Value>Valueprev

Possible Problems:

- None.

Test DHCP_CONF.10.2.4: Transmission of Renew Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router transmits properly formatted Rebind messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 12.1
- [DHCP 3315] –Sections 5.5, 14, 18.1.2, 18.1.3 and 18.1.4

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Renew message format.

1. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
2. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA.
3. After time T1 observe the messages transmitted Link A.

Part B: Retransmission of Renew message, T1 and T2 non-zero.

4. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
5. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA.
6. Observe the messages transmitted on Link A until second Renew message received.

Part C: Maximum Retransmission Time of Renew message, T1 and T2 non-zero.

7. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
8. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA.
9. Observe the messages transmitted on Link A for time T2.

Part D: Maximum Retransmission Duration of Renew message, T1 and T2 non-zero.

10. Enabled dhcpv6 in NUT, TR1 sets T1 to 50s and T2 to 80s.
11. The NUT should have received IPv6 address information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA.
12. Observe the messages transmitted on Link A for time T2.

Observable Results:

- *Part A*

  Step 3: The NUT should send its first Renew message T1 (50) seconds after the reception of the Reply message from TN1.The NUT transmits a properly formatted Renew message to TN1 containing:

  - A "msg-type" field set to the value of RENEW (5)
  - A header containing a Transaction ID
  - A Server Identifier Option (containing a server DUID)

- A Client Identifier Option (containing a client DUID)
- An IA PD Option with the proper IPv6 prefix associated with the IA.

- *Part B*

  Step 6: The NUT transmits properly formatted Renew message according to the Second Message in the chart below.

Renew Message	Minimum Delay	Maximum Delay
First message	Time T1	Time T1
Second message	9 seconds = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 seconds = IRT + RAND*IRT Where IRT=10, RAND= +.1

- *Part C*

  Step 9: The NUT should properly transmit Renew messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Renew Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	9 = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 = IRT + RAND*IRT Where IRT=10, RAND= +.1
| |	| |	| |
X message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600
X+1 message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600

X+1 message that after T2 (2000 seconds) is not observed.

The first Renew message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Renew messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Renew message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Renew message was received. The elapsed-time value of these Renew messages should be in the range of the follow chat:

Renew message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=9000ms =IRT+RAND*IRT Where IRT=10s, RAND=-0.1	Value=11000ms = IRT+RAND*IRT Where IRT=10s, RAND=0.1
Third message	Value=26100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=34100ms =Valueprev+ RT RT=2*RTprev+RAND*RTpre v Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff

| |	Value=0xffff	Value=0xffff

- *Part D*

  Step 12: The NUT must terminate the message transmission of Renew message after MRD (Remaining time until T2). The NUT must not transmit any more Renew messages. The transaction ID is the same for all retransmitted messages.

-

Possible Problems:

- None.

Test DHCP_CONF.10.2.5: Transmission of Rebind Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router transmits properly formatted Request messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 12.1
- [DHCP 3315] – Sections 5.5, 14 and 18.1.4

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Transmission of Rebind message after T2 expires

1. Common Test Setup is performed with T1=50s and T2=80s.
2. After time T2 observe the messages transmitted on Link A.

Part B Retransmission of Rebind message after T2 expires

3. Common Test Setup is performed with T1=50s and T2=80s.
4. After time T2 observe the messages transmitted on Link A.

Part C: Transmission of Rebind message after link down situation

5. Common Test Setup is performed with T1=50s and T2=80s.
6. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
7. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
8. Observe the messages transmitted on Link A.

Part D: Retransmission of Rebind message after link down situation

9. Common Test Setup is performed with T1=50s and T2=80s.
10. Physically disconnect the NUT interface on Link A. (This can also be achieved by disabling and re-enabling the network interface)
11. After enough time elapses in which the NUT recognizes a link down situation (5 seconds), reconnect the NUT to Link A.
12. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Rebind message containing an IA_PD option with the following values:

  - the same IAID as sent in Step 1
  - A "msg-type" field set to the value of REBIND (6).
  - A header containing a Transaction ID
  - A Client Identifier Option (containing a DUID)
  - An IA Prefix Option with the proper IPv6 prefix associated with the IA

- *Part B*

Step 4: The NUT should properly transmit Rebind messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Rebind Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	9 = IRT + RAND*IRT Where IRT=10, RAND= -.1	11 = IRT + RAND*IRT Where IRT=10, RAND= +.1
| |	| |	| |
X message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600
X+1 message	540 seconds =.9*MRT where MRT=600	660 seconds =1.1*MRT where MRT=600

X+1 message that after valid lifetime (3000s) is not observed

- *Part C*

Step 8: The NUT transmits a properly formatted Rebind message containing an IA_PD option with the following values**:**

  - the same IAID as sent in Step 1
  - a Prefix Option containing the IPv6 Prefix allocated to the NUT in Step 1

- *Part D*

Step 12: The NUT should properly transmit Rebind messages according to the chart below. The transaction ID is the same for all retransmitted messages.

Renew Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9s = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1s = IRT + RAND*IRT Where IRT=1, RAND= +.1
| |	| |	| |
X message	3.6 seconds =.9*MRT where MRT=4	4.4 seconds =1.1*MRT where MRT=4
X+1 message	3.6 seconds =.9*MRT where MRT=4	4.4 seconds =1.1*MRT where MRT=4

X+1 message that after CNF_MAX_RD (10s) is not observed

The first Rebind message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Rebind messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Rebind message was received, but elapsed-time value set to 0xffff when the time elapsed 0xffff since the first Rebind message was received. The elapsed-time value of these Rebind messages should be in the range of the follow chat:

Rebind message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0

Second message	Value=9000ms =IRT+RAND*IRT Where IRT=10s, RAND=-0.1	Value=11000ms = IRT+RAND*IRT Where IRT=10s, RAND=0.1
Third message	Value=26100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=34100ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
| |	Value>Valueprev	Value>Valueprev
Y message	Value=0xffff	Value=0xffff
| |	Value=0xffff	Value=0xffff

Possible Problems:

- None

Test DHCP_CONF.10.2.6: Transmission of Release Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router transmits properly formatted Release messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 12.1
- [DHCP 3315] – Sections 5.5, 14 and 18.1.6

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Release message format

1. Verify that the NUT is configured with the received IPv6 prefix information from TR1.
2. Configure the client to release the IPv6 prefix.
3. Observe any messages transmitted on Link A.

Part B: Retransmission of Release message

4. Verify that the NUT is configured with the received IPv6 prefix information from TR1.
5. Configure the client to release the IPv6 prefix.
6. Observe the messages transmitted on Link A until second Release message received.

Part C: Maximum Retransmission Count of Release message, no Reply message from Server

7. Verify that the NUT is configured with the received IPv6 prefix information from TR1.
8. Configure the client to release the IPv6 prefix.
9. Continuously observe the messages transmitted on Link A.

Part D: Retransmission and message exchange termination, Server responds with Reply message

10. Verify that the NUT is configured with the received IPv6 prefix information from TR1.
11. Configure the client to release the IPv6 prefix.
12. Upon reception of the NUT's second Release message, TR1 transmits a Reply message to the NUT that includes a Status Code option with value NoBinding for each IA in the NUT's Release message.
13. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Release message to TN1 containing:
  - A "msg-type" field set to the value of 8 (RELEASE).
  - A header containing a Transaction ID.
  - A Client Identifier Option (containing a DUID)
  - A Server Identifier Option
  - An IA PD Option with the proper IPv6 prefix associated with the IA
- *Part B*

Step 6: The NUT transmits a properly formatted Release Message according to the Second Message in the chart below.

Release Message	Minimum Delay	Maximum Delay
First message	-	-
Second message	0.9 seconds = IRT + RAND*IRT Where IRT=1, RAND= -.1	1.1 seconds = IRT + RAND*IRT Where IRT=1, RAND= +.1

- *Part C*

  Step 9: The NUT must terminate the message exchange after the transmission of REL_MAX_RC (5) Release messages. The NUT must not transmit any more Release messages. The transaction ID is the same for all retransmitted messages.

  The first Release message contains an Elapsed Time option with its elapsed-time value set to 0, and NUT retransmitted the Release messages containing an Elapsed Time option with its elapsed-time value set to the time elapsed since the first Release message was received, The elapsed-time value of these Release messages should be in the range of the follow chat:

Release message	Minimum of Elapsed-time value	Maximum of Elapsed-time value
First message	0	0
Second message	Value=900ms =IRT+RAND*IRT Where IRT=1s, RAND=-0.1	Value=1100ms = IRT+RAND*IRT Where IRT=1s, RAND=0.1
Third message	Value=2610ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=3410ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
4th message	Value=5859ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=8051ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1
5th message	Value=12032ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=-0.1	Value=17798ms =Valueprev+ RT RT=2*RTprev+RAND*RTprev Where RAND=0.1

- *Part D*

  Step 13: The NUT ceases the transmission of Release messages upon reception of the Reply message from TN1.

Possible Problems:

- None

Group 3: Message Reception

Scope:

The following tests focus on the requesting route's (Client) r implementation of DHCPv6 and the reception of valid and invalid DHCPv6 messages by a server device.

Test DHCP_CONF.10.3.1: Receipt of Advertise Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router properly handles the reception of Advertise messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 11.1

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. When a Solicit message is received from the NUT, TR1 transmits a properly formatted Advertise message. The Advertise message contains a Status Code option containing the value NoPrefixAvail (code 6).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT must silently discard the Advertise message. The NUT may display the associated status message to the user. The NUT must continue to transmit Solicit messages.

Possible Problems:

- None

Test DHCP_CONF.10.3.2: Receipt of Reply Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router properly handles the reception of Reply messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 9,10 and 12.1
- [DHCP 3315] – Section 18.1.8

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Valid Reply message in response to Request

1. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
2. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message with a IA_PD option (Prefix1, T1=50s, T2=80s).
3. Wait 50 seconds.
4. Observe the messages transmitted on Link A.

Part B: T1 and T2 times recorded

5. Common Test Setup is performed with T1=50s and T2=80s.
6. Wait 50 seconds
7. Observe the messages transmitted on Link A.
8. Wait 30 seconds
9. Observe the messages transmitted on Link A.

Part C: T1 and T2 times updated

10. Common Test Setup is performed with T1=50s and T2=80s.
11. Wait 50 seconds. Upon reception of the Renew from the NUT, TR1 transmits a properly formatted Reply message with a IA_PD option (T1=60s T2=90s)
12. Wait 60 seconds.
13. Observe the messages transmitted on Link A.
14. Wait 30 seconds.
15. Observe the message transmitted on Link A.

Part D: New Prefix in IA_PD option

16. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
17. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message with an IA_PD option (T1=50s with one Prefix option Prefix1).
18. Upon reception of the Renew from the NUT, TR1 transmits a properly formatted Reply message with an IA_PD options including two Prefix options (Prefix1 and Prefix2).
19. After another T1 time elapse, NUT transmits a Renew message.
20. Observe the messages transmitted on Link A.

Part E: update Lifetimes

21. Common Test Setup is performed with T1=50s and T2=80s.

22. Upon reception of the Renew from the NUT, TR1 transmits a properly formatted Reply message with an IA_PD option. The prefix included has valid lifetime set to 100s.
23. Observe the messages transmitted on Link A.
24. Wait 100 seconds
25. Observe the messages transmitted on Link A.

Part F: Valid Lifetime set to zero

26. Common Test Setup is performed with T1=50s and T2=80s.
27. Upon reception of the Renew from the NUT, TR1 transmits a properly formatted Reply message with an IA_PD option. The included prefix has valid lifetime set to 0s.
28. Observe the messages transmitted on Link A.

Part G: IA Prefix option not included in IA PD from Server

29. Common Test Setup is performed with T1=50s and T2=80s.
30. Upon reception of the Renew from the NUT, TR1 transmits a properly formatted Reply message with an IA_PD option without an IA prefix option.
31. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 4: The NUT must transmit valid Renew message with validity Prefix value: Prefix1.
- *Part B*
  Step7: The NUT transmits a Renew message to TR1.
  Step 9: The NUT transmits a Rebind message to TR1.
- *Part C*
  Step 13: The NUT transmits a Renew message to TR1.
  Step 15: The NUT transmits a Rebind message to TR1.
- *Part D*
  Step 20: The NUT must transmit valid Renew message with Prefix1.
- *Part E*
  Step 23: The NUT must transmit Renew message and Rebind message.
  Step 25: The NUT must transmit Solicit message.
- *Part F*
  Step 28: The NUT should not transmit any Renew message.
- *Part G*
  Step 31: The NUT should transmit a Renew message.

Possible Problems:

- None

Test DHCP_CONF.10.3.3: Receipt of Reply Messages for Prefix Delegation cont'd

Purpose: To verify that the DHCP requesting router properly handles the reception of Reply messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 9,10 and 11.1
- [DHCP 3315] – Section 18.1.8

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Reply Message contains NotOnLink in response to a Request message

1. Enable DHCPv6 on the NUT.
2. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
3. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message containing a Status Code option with a value NotOnLink
4. Observe the messages transmitted on Link A.

Part B: Reply Message contains NoPrefixAvail in response to a Request message

5. Enable DHCPv6 on the NUT.
6. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
7. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message containing a Status Code option with a value NoPrefixAvail in the IA PD option.
8. Observe the messages transmitted on Link A.

Part C: Reply Message contains NoBinding in response to a Renew message

9. Common Test Setup is performed with T1=50s and T2=80s.
10. Upon reception of a Renew message from the NUT, TR1 transmits a properly formatted Reply message containing a Status Code option with a value of NoBinding for the IAs for which the NUT requested configuration.
11. Observe the messages transmitted on Link A.

Part D: Reply Message contains no IA in response to a Renew message

12. Common Test Setup is performed with T1=50s and T2=80s.
13. Upon reception of a Renew message from the NUT, TR1 transmits a properly formatted Reply message that does not contain the IAs the NUT requested.
14. Observe the messages transmitted on Link A.

Part E: Reply Message contains no IA in response to a Rebind message

15. Common Test Setup is performed with T1=50s and T2=80s.
16. Upon reception of a Rebind message from the NUT, TR1 transmits a properly formatted Reply message that does not contain the IAs the NUT requested.
17. Observe the messages transmitted on Link A.

Part F: Reply Message contains NoBinding in response to a Release message

18. Common Test Setup is performed with T1=50s and T2=80s.

19. Configure the NUT to release the configured prefix.
20. Upon reception of a Release message from the NUT, TR1 transmits a properly formatted Reply message with a Status Option code of NoBinding for the IAs for which the NUT requested configuration.
21. Observe the messages transmitted on Link A.

Part G: Reply message contains UnspecFail.

22. Enable DHCPv6 on NUT.
23. Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
24. Upon reception of a Request message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of UnspecFail.
25. Observe the messages transmitted on Link A.

Part H: Reply message contains UseMulticast.

26. Enable DHCPv6 on NUT.
27. Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.
28. Upon reception of a Request message from the NUT, TN1 transmits a Reply message with a Status Code option with the value UseMulticast.
29. Observe the messages transmitted on Link A.

Part I: Reply message contains NoBinding in response to a Rebind message.

30. The NUT should have received IPv6 Prefix information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 50s and T2 to 80s).
31. Upon reception of a Rebind message from the NUT, TN1 transmits a properly formatted Reply message containing a Status Code option with a value of NoBinding for the IAs for which the NUT requested configuration.
32. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 4: The NUT should begin a DHCP server solicitation and transmit a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2), or retransmit the Request message (with the same transaction ID) without specifying any addresses.
- *Part B*
  Step 8: The NUT must begin a DHCP server solicitation and transmit a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
- *Part C*
  Step 11: Upon reception of the Reply message from TN1, the NUT should transmit a Request message with a Server ID option identifying TN1 for each of the IAs that the NUT included in the Renew message. The NUT must not send any additional Renew message.
- *Part D*
  Step 14: The NUT should transmit a Renew message to TR1.
- *Part E*
  Step 17: The NUT should transmit a Rebind message to TR1.
- *Part F*

Step 22: The NUT should transmit request message.

- *Part G*

  Step 25: The NUT must continue transmitting its Request message. The NUT must limit the rate at which it retransmits the message and limit the duration of the time during which it retransmits the message.
- *Part H*

  Step 29: The NUT should resend the original Request message to the server using multicast through the interface on which the Reply message from TN1 was received.
- *Part I*

  Step 32: Upon reception of the Reply message from TN1, the NUT should transmit a Request message.

Possible Problems:

- None

Test DHCP_CONF.10.3.4: Receipt of invalid Reply Messages for Prefix Delegation

Purpose: To verify that the DHCP requesting router properly handles the validation of Reply messages received for Prefix Delegation.

References:

- [DHCP 3633] – Section 9 and 10
- [DHCP 3315] – Section 18.1.8

Test Setup: Connect the network as described in the Common Topology and Common Test Setup 1.1 is performed. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Reply Message contains IA_PD option with T1>T2

1. Enable DHCPv6 on the NUT
2. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
3. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message containing an IA_PD option with T1 greater than T2.
4. Wait T1 time.
5. Observe the messages transmitted on Link A.

Part B: Reply Message contains invalid Prefix (preferred lifetime > valid lifetime)

6. Enable DHCPv6 on the NUT.
7. Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.
8. Upon reception of the Request from the NUT, TR1 transmits a properly formatted Reply message containing IA_PD (Prefix1, T1=50s, T2=80s).
9. After 50 seconds. Upon reception of the Renew Message from the NUT, TR1 transmits a properly formatted Reply message containing IA_PD with preferred lifetime > valid lifetime and Prefix2 = 3ffe:501:aaaa:/48;
10. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 5: The NUT must NOT transmit any Renew message to TR1.
- *Part B*
  Step 10: The NUT must transmit a Renew message with the prefix = Prefix1 to the TR1 .

Possible Problems:

- None

Test DHCP_CONF.10.3.5: Reception of Invalid Advertise message

Purpose: To verify a requesting router device properly handles the reception of invalid Advertise messages.

References:

- [DHCP 3315] – Sections 15, 15.3 and 17.1.3

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the client device before each part. Disable DHCPv6 on the client device after each part.

Procedure:

Part A: No Server Identifier option

1. When a Solicit message is received from the NUT, TN1 transmits an Advertise message that does not contain a Server Identifier option.
2. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

3. When a Solicit message is received from the NUT, TN1 transmits an Advertise message that does not contain a Client Identifier option.
4. Observe the messages transmitted on Link A.

Part C: Client Identifier that does not match the DUID of the client

5. When a Solicit message is received from the NUT, TN1 transmits a properly formatted Advertise message. The Advertise message contains a Client Identifier option whose value does not match the client's DUID.
6. Observe the messages transmitted on Link A.

Part D: Transaction ID Mismatch

7. When a Solicit message is received from the NUT, TN1 transmits a properly formatted Advertise message. The Advertise message contains a transaction-id field value that does not match the value the client used in its Solicit message.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.
- *Part B*

  Step 4: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.
- *Part C*

  Step 6: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.

- *Part D*

  Step 8: The NUT must silently discard the Advertise message. The NUT must not send a Request message based on the received Advertise message but must continue to transmit Solicit messages.

Possible Problems:

- None.

Test DHCP_CONF.10.3.6: Client Message Validation

Purpose: To verify a requesting router device properly discards all Solicit, Request, Confirm, Renew, Rebind, Decline, Release, Relay-forward, Relay-reply and Information-Request messages.

References:

- [DHCP 3315] – Sections 15.2, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.12, 15.13 and 15.14

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.1 is performed before each part. Disable DHCPv6 on the requesting router device after each part.

Procedure:

Part A: Solicit message (type 1)

1. The NUT should receive IPv6 Prefix information from TN1.
2. TN1 transmits a Solicit message to the NUT port 546.
3. Observe the messages transmitted on Link A.

Part B: Request message (type 3)

4. The NUT should receive IPv6 Prefix information from TN1.
5. TN1 transmits a Request message to the NUT port 546.
6. Observe the messages transmitted on Link A.

Part C: Renew message (type 5)

7. The NUT should receive IPv6 Prefix information from TN1.
8. TN1 transmits a Renew message to the NUT port 546.
9. Observe the messages transmitted on Link A.

Part D: Rebind message (type 6)

10. The NUT should receive IPv6 Prefix information from TN1.
11. TN1 transmits a Rebind message to the NUT port 546.
12. Observe the messages transmitted on Link A.

Part E: Release message (type 8)

13. The NUT should receive IPv6 Prefix information from TN1.
14. TN1 transmits a Release message to the NUT port 546.
15. Observe the messages transmitted on Link A.

Part F: Relay-forward message (type 12)

16. The NUT should receive IPv6 Prefix information from TN1.
17. TN1 transmits a Relay-forward message to the NUT port 546.
18. Observe the messages transmitted on Link A.

Part G: Relay-reply message (type 13)

19. The NUT should receive IPv6 Prefix information from TN1.
20. TN1 transmits a Relay-reply message to the NUT port 546.
21. Observe the messages transmitted on Link A.

Part H: Information-request message (type 11)

22. The NUT should receive IPv6 address information from TN1.
23. TN1 transmits an Information-request message to the NUT port 546.
24. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 3: The NUT discards the Solicit message from TN1 and does not transmit any packets.
- *Part B*
  Step 6: The NUT discards the Request message from TN1 and does not transmit any packets.
- *Part C*
  Step 9: The NUT discards the Renew message from TN1 and does not transmit any packets.
- *Part D*
  Step 12: The NUT discards the Rebind message from TN1 and does not transmit any packets.
- *Part E*
  Step 15: The NUT discards the Release message from TN1 and does not transmit any packets.
- *Part F*
  Step 18: The NUT discards the Relay-forward message from TN1 and does not transmit any packets.
- *Part G*
  Step 21: The NUT discards the Relay-reply messages from TN1 and does not transmit any packets.
- *Part H*
  Step 24: The NUT discards the Information-request messages from TN1 and does not transmit any packets.

Possible Problems:

- None.

Section 11: RFC 3633 – Delegating Router (Server) Specification

Scope

The following tests cover specifications for the delegating router (Server) implementation of IPv6 Prefix options for Dynamic Host Configuration Protocol (DHCP) version 6, Request For Comments 3633. These tests verify the process for transmitting a list of available IPv6 Prefix options from a server in Dynamic Host Configuration Protocol for IPv6.

Overview

These tests are designed to verify the readiness of a DHCPv6 delegating router (Server) implementation vis-à-vis the IPv6 Prefix options for Dynamic Host Configuration Protocol for IPv6 specification.

Group 1: Delegating Router (Server) Basic Behaviors, Constants and Format

Scope

The following tests focus on the DHCP Basic Behaviors, constants and format. The messages that are sent by the requesting router will locate delegating router that will assign the IPv6 prefix and/or additional configuration information pertaining to client IAs. Tests in this section are focused on delegating router (Server) devices.
The following tests focus on the delegating router's implementation of DHCPv6 constants and message format.

Test DHCP_CONF.11.1.1: Basic Message Exchanges

Purpose: To verify a DHCPv6 delegating router (server) device properly handles the reception of DHCPv6 messages during a basic message exchange.

References:

- [DHCP 3633] – Section 7,11.2,12.2

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Valid Advertise message in response to Solicit and valid Reply message in response to Request.

1. Common Test Setup 1.1 is performed for Server device.
2. Observe the messages transmitted on Link A, while Step1 is performed.

Part B: Valid Reply message in response to a Renew message.

3. Common Test Setup 1.1 is performed for Server device.
4. TN1 transmits a valid Renew message with an IA_ PD and IA Prefixes Option to the NUT.
5. Observe the messages transmitted on Link A.

Part C: Valid Reply message in response to a Rebind message.

6. Common Test Setup 1.1 is performed for Server device.
7. TN1 transmits a valid Rebind message with an IA_ PD and IA Prefixes Option to the NUT.
8. Observe the messages transmitted on Link A.

Part D: Valid Reply message in response to a Release message.

9. Common Test Setup 1.1 is performed for Server device.
10. TN1 transmits a valid Release message with an IA_PD and IA Prefixes Option to the NUT.
11. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 2: The NUT transmitted an Advertise message in response to the Solicit message and a Reply message in response to the Request message from TN1.
- *Part B*
  Step 5: The NUT transmitted a Reply message in response to the Renew message.
- *Part C*
  Step 8: The NUT transmitted a Reply message in response to the Rebind message.
- *Part D*
  Step 11: The NUT transmitted a Reply message in response to the Release message.

Possible Problems:

- None.

Test DHCP_CONF.11.1.2: IA_PD Option Format

Purpose: To verify that the delegating router transmits the correct dhcpv6 message with a valid IA_PD option.

References:

- [DHCP 3633] –Section 6, 9 and 10

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: IA_PD Option Format in Advertise message

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a properly formatted Solicit message including an IA_PD option with a Prefix option.
3. Observe the messages transmitted on Link A.

Part B: IA_PD Option Format in Reply message

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a properly formatted Request message including an IA_PD option with a Prefix option.
6. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message on Link A.
7. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Advertise message containing the following elements:

    - Destination address set to TN1's unicast address same as the Solicit message's source address
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - An IA PD option set to the following values:
        - An option-code set to OPTION_IAPREFIX(25)
        - An option-length set to 12 + length of IA_PD options field
        - An IAID value set to a number
        - IPv6 Prefix
        - A preferred lifetime
        - A valid lifetime
        - IAprefix-options: Status code = Success (0)

- *Part B*

  Step 7: The NUT transmits a properly formatted Reply message containing the following elements:
    - Destination address set to TN1's unicast address same as the Request message's source address
    - A msg-type field set to REPLY (4)
    - A transaction-id set to the same as Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - An IA PD option set to the following values:
        - An option-code set to OPTION_IAPREFIX(25)
        - An option-length set to 12 + length of IA_PD options field
        - An IAID value set to a number
        - IPv6 Prefix
        - A preferred lifetime
        - A valid lifetime
        - IAprefix-options: Status code = Success (0)

Possible Problems:

- None

Test DHCP_CONF.11.1.3: Transaction ID Consistency: Basic Exchange

Purpose: To verify a DHCPv6 delegating router device properly uses the same transaction id as the requesting router.

References:

- [DHCP 3315] – Section 15.1

Test Setup: Connect the devices according to the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

1. TN1 transmits a valid solicit message (transaction-id is 100).
2. Observe the messages transmitted on Link A.
3. Upon the reception of an Advertise message from the NUT, TN1 transmits a valid Request message (transaction-id is 101).
4. Observe the messages transmitted on Link A.

Observable Results:

Step 2: The NUT transmitted an Advertise message in response to the Solicit message from TN1 with matching transaction ids (100)
Step 4: The NUT transmitted a Reply message in response to the Request message from TN1 with matching transaction ids (101).

Possible Problems:

- None.

Test DHCP_CONF.11.1.4: Implementation of DHCP constants

Purpose: To verify that the delegating router listens on the correct UDP port and transmits messages to the correct DHCP constant address.

References:

- [DHCP 3315] – Section 5.2
- [RFC 2463] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

Part A: Valid UDP port

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message to UDP destination port 547.
3. Observe the messages transmitted on Link A.

Part B: Invalid UDP port

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message to UDP destination port 33536.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT must transmit an Advertise message with a destination UDP port set to 546.
- *Part B*
  Step 6: The NUT should silently ignore the Solicit message from TN and does not send any DHCPv6 messages.

Possible Problems:

- None.

Test DHCP_CONF.11.1.5: Server Message Format

Purpose: To verify that the server transmits a DHCPv6 message with the proper format.

References:

- [DHCP 3315] – Section 6, 7, 7.1, 7.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

Part A: Client/Server Message Format

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2).
3. Observe the messages transmitted on Link A.

Part B: Relay Agent/Server Message Format

4. Enable DHCPv6 on the NUT.
5. TN5 transmits a Relay Forward Solicit message from TN3 to the NUT.
6. Observe the messages on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Advertise message containing the following elements:
  - The msg-type field was set to the value of 2 (Advertise)
  - A header containing a non-zero value Transaction ID
  - A Server Identifier Option (containing a DUID)
  - A Client Identifier Option (containing a DUID)
- *Part B*

  Step 6: The NUT transmits a properly formatted Relay Reply message containing the following elements:
  - The msg-type field was set to the value of 13(Relay-Reply)
  - Hop-count (Copied from the Relay-forward message)
  - Link-address (Copied from the Relay-forward message)
  - Peer-address (Copied from the Relay-forward message)
  - A Relay Message Option

Possible Problems:

- None.

Test DHCP_CONF.11.1.6: Server Identifier Option Format

Purpose: To verify the format of the DHCPv6 delegating router Identifier option.

References:

- [DHCP 3315] – Section 22.3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Server Identifier option values:

- An option-code set to OPTION_SERVERID(2)
- An option-length set to the length of DUID in octets
- DUID Field set to any non-zero number

Possible Problems:

- None.

Test DHCP_CONF.11.1.7: Client Identifier Option

Purpose: To verify the format of the DHCPv6 Client Identifier option.

References:

- [DHCP 3315] – Section 22.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Client Identifier option values:

- An option-code set to OPTION_CLIENTID(1)
- An option-length set to the length of DUID in octets
- Same DUID value as in the Solicit message

Possible Problems:

- None.

Test DHCP_CONF.11.1.8: Status Code Option Format

Purpose: To verify that the DHCP delegating router transmits the correct Status Code Option format.

References:

- [DHCP 3315] – Section 18.2.1 and 22.13

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a solicit message on Link A.
3. After the reception of an Advertise message from NUT, TN1 transmits a Request message with inappropriate IP prefix for the Link in IA PD option.
4. Observe the messages transmitted on Link A.

Observable Results:

Steps 4: The NUT transmits a properly formatted Reply message containing the following Status Code option values:

- An option-code set to OPTION_STATUS_CODE (13)
- An option-length set to 2 + length of status-message
- A status-code set to NotOnLink (4)
- A status-message set to any

Possible Problems:

- None.

Test DHCP_CONF.11.1.9: Relay Message Option Format

Purpose: To verify that the DHCP delegating router transmits the correct Relay Message Option format.

References:

- [DHCP 3315] – Section 22.10

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN5 transmits a Relay Forward Solicit message with a Relay Message option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following Relay Message option values:

- An option-code set to OPTION_RELAY_MSG(9)
- An option-length set to length of DHCP-relay-message
- A DHCP-relay-message containing Advertise message.

Possible Problems:

- None.

Test DHCP_CONF.11.1.10: Interface ID Option Format

Purpose: To verify that the DHCP delegating router transmits the correct Interface ID Option format.

References:

- [DHCP 3315] – Section 22.18

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the delegating router device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN5 transmits a Relay Forward Solicit message with an Interface ID option from TN3 to the NUT.
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Relay- reply advertise message that includes the same Interface ID option transmitted in the Relay-forward message (Step2). And the Interface ID option values:

- An option-code set to OPTION_INTERFACE_ID (18)
- An option-length set to length of interface-id
- A interface-id set to any

Possible Problems:

- None.

Group 2: Server Message Transmission

Scope

The following tests focus on the delegating router message creation, transmission and termination of DHCP IPv6 exchanges. Tests in this section are focused on server devices.

Test DHCP_CONF.11.2.1: Transmission of Advertise Messages for Prefix Delegation

Purpose: To verify that the delegating router (server) transmits the correct advertise message.

References:

- [DHCP 3633] –Section 7, 9 and 11.2

Test Setup: Connect the devices according to the Common Topology. DHCPv6 on the NUT is disabled after each part.

Procedure:

Part A: Advertise message transmission

1. TN1 transmits a valid Solicit message on Link A.
2. Observe the messages transmitted on Link A.

Part B: Multi Solicits requires

3. Enable DHCPv6 on the NUT.
4. TN1 transmits a properly formatted Solicit message including an IA_PD option with a Prefix option.
5. Observe the messages transmitted on Link A.
6. TN2 transmits a properly formatted Solicit message including an IA_PD option with a Prefix option Enable DHCPv6 on the NUT.
7. Observe the messages transmitted on Link A.

Part C: Advertise message in response to Solicit message with IA_PD Option

8. TN1 transmits a valid Solicit message with an IA_PD option on Link A.
9. Observe the messages transmitted on Link A.

Part D: Advertise message in response to Solicit message with Multiple IA_PD Options

10. TN1 transmits a valid Solicit message with two IA_PD options on Link A.
11. Observe the messages transmitted on Link A.

Part E: Relay-Reply message with Advertise message (w/o Interface-id Option)

12. TN5 transmits a valid Relay-forward Solicit message on Link A.
13. Observe the messages transmitted on Link A.

Part F: Relay-Reply message with Advertise message (w/ Interface-id Option)

14. TN5 transmits a valid Relay-forward Solicit message with an Interface-id option on Link A.
15. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Advertise message containing the following elements:

  - Destination address set to TN1's unicast address same as the Solicit message's source address
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as the Solicit message's transaction-id

- A Server Identifier option (containing a DUID)
- A Client Identifier option set to the same as Solicit message's Client Identifier option

- *Part B*

  Step 5: The NUT transmits a properly formatted Advertise message containing the following elements:
    - Destination address set to TN1's unicast address same as the Solicit message's source address
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - An IA PD option set to the following values:
        - An option-code set to OPTION_IAPREFIX(25)
        - An option-length set to 12 + length of IA_PD options field
        - An IAID value set to a number
        - IPv6 Prefix
        - A preferred lifetime
        - A valid lifetime

  Step7: The NUT transmits a properly formatted Advertise message containing the following elements:
    - Destination address set to TN2's unicast address same as the Solicit message's source address
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - An IA PD option set to the following values:
        - An option-code set to OPTION_IAPREFIX(25)
        - An option-length set to 12 + length of IA_PD options field
        - An IAID value set to a number
        - IPv6 Prefix different with Step5
        - A preferred lifetime
        - A valid lifetime

- *Part C*

  Step 9: The NUT transmits a properly formatted Advertise message containing the following elements:
    - Destination address set to TN1's unicast address same as the Solicit message's source address
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - An IA PD option set to the following values:
        - An option-code set to OPTION_IAPREFIX(25)

- An option-length set to 12 + length of IA_PD options field
  - An IAID value set to a number
  - IPv6 Prefix
  - A preferred lifetime
  - A valid lifetime
- *Part D*

  Step 11: The NUT transmits a properly formatted Advertise message containing the following elements:
  - Destination address set to TN1's unicast address same as the Solicit message's source address
  - A msg-type field set to ADVERTISE (2)
  - A transaction-id set to the same as Solicit message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Solicit message's Client Identifier option
  - Two IA_PD options
- *Part E*

  Step 13: The NUT transmits a properly formatted Relay-Reply message with Advertise message. The destination address is set to TN5's address.
- *Part F*

  Step 15: The NUT transmits a properly formatted Relay-Reply message with Advertise message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.

Possible Problems:

- None

Test DHCP_CONF.11.2.2: Transmission of Reply Messages for Prefix Delegation

Purpose: To verify the delegating router (server) transmits properly formatted Reply messages for Prefix Delegation.

References:

- [DHCP 3633] – Sections 6 and 12.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Reply message transmission

1. Enable DHCPv6 on the NUT.
2. TN1 transmit a valid Solicit message on Link A.
3. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message on Link A.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing the following elements:
  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY (7)
  - A transaction-id set to the same as Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - An IA PD option set to the following values:
    - An option-code set to OPTION_IAPREFIX(25)
    - An option-length set to 12 + length of IA_PD options field
    - An IAID value set to a number
    - IPv6 Prefix
    - A preferred lifetime
    - A valid lifetime
    - IAprefix-options: Status code = Success (0)

Possible Problems:

- None

Test DHCP_CONF.11.2.3: Transmission of Relay-Reply messages

Purpose: To verify the delegating router (server) transmits properly formatted Relay-Reply messages for Prefix Delegation.

References: [DHCP 3633] – Sections 6 and 9

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Relay-Reply message with Advertise message (w/o Interface-id)

1. TN5 transmits a valid Relay-forward Solicit message on Link A.
2. Observe the messages transmitted on Link A.

Part B: Relay-Reply message with Advertise message (w/ Interface-id)

3. TN5 transmits a valid Relay-forward Solicit message with an Interface-id option on Link A.
4. Observe the messages transmitted on Link A.

Part C: Relay-Reply message with Reply message (w/o Interface-id)

5. TN5 transmits a valid Relay-forward Solicit message on Link A.
6. After the reception of a Relay-Reply Advertise message, TN5 transmits a valid Relay-forward Request message on Link A.
7. Observe the messages transmitted on Link A.

Part D: Relay-Reply message with Reply message (w/ Interface-id)

8. TN5 transmits a valid Relay-forward Solicit message with an Interface-id option on Link A.
9. After the reception of a Relay-Reply Advertise message with an Interface-id option, TN5 transmits a valid Relay-forward Request message with an Interface-id option on Link A.
10. Observe the messages transmitted on Link A.

Part E: Relay-Reply message transmission through the same Relay agents

12. TN5 transmits a Relay-forward Solicit message from TN3 on Link A.
13. Observe the messages transmitted on Link A.
14. TN6 transmits a Relay-forward Solicit message from TN3 on Link A.
15. Observe the messages transmitted on Link A.

Part F: Relay-Reply message transmission through the layered Relay agents

16. TN4 transmits a Solicit message on Link C. TN7 transmits a Relay-forward Solicit message from TN4 on Link B. TN5 transmits a valid Relay-forward Solicit message from TN7 on Link A.
17. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Relay-Reply Advertise message containing the following elements:
  - Destination address set to TN5's unicast address same as the Relay-forward message's source address
  - A msg-type field set to RELAY-REPL(13)
  - A hop-count set to the same as Relay-forward Solicit message's hop-count

- A link-address set to the same as Relay-forward Solicit message's link-address
- A peer-address set to the same as Relay-forward Solicit message's peer-address
- A Relay Message option with following values:
  - An msg-type set to OPTION_RELAY_MSG (9)
  - An option-length set to length of DHCP-relay-message field
  - A DHCP-relay-message set to an Advertise message
  - An Advertise message containing the following elements:
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Relay-forward Solicit message's Client Identifier option
    - A IA_PD option

- *Part B*

  Step 4: The NUT transmits a properly formatted Relay-Reply message with Advertise message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.
- *Part C*

  Step 7: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address.
- *Part D*

  Step 10: The NUT transmits a properly formatted Relay-Reply message with Reply message. The destination address is set to TN5's address and the Interface-id option is the same as Relay-forward message.
- *Part E*

  Step 13: The NUT transmits a Relay-Reply Advertise message to TN5.
  Step 15: The NUT transmits a Relay-Reply Advertise message to TN6.
- *Part F*

  Step 17: The NUT transmits a properly formatted Reply-Reply Advertise message containing the following elements:
  - A msg-type set to RELAY-REPLY (13)
  - A hop-count set to 1
  - A link-address set to zero
  - A peer-address set to TN7's Global or Link Local Address on Link C.
  - A DHCP-relay-message set to a Relay Message Option:
    - A msg-type set to RELAY-REPLY (13)
    - A hop-count set to 0
    - A link-address set to TN7's Global Address on Link D.
    - Peer-address set to TN4's Link Local Address
    - A DHCP-relay-message set to an Advertise message

Possible Problems:

- None.

Group 3: Message Reception

Scope:

The following tests focus on the requesting router's implementation of DHCPv6 and the reception of valid and invalid DHCPv6 messages by a delegating router device.

Test DHCP_CONF.11.3.1 Reception of Solicit messages

Purpose: To verify a server device properly handles the reception of Solicit messages.

References:

- [DHCP 3633] – Section 11.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Solicit message via unicast

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with unicast destination address to the NUT.
3. Observe the messages transmitted on Link A.

Part B: Reception of Solicit message with DUID-LLT

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message using DUID-LLT.
6. Observe the messages transmitted on Link A.

Part C: Reception of Solicit message with DUID-EN

7. Enable DHCPv6 on the NUT.
8. TN1 transmits a Solicit message using DUID-EN.
9. Observe the messages transmitted on Link A.

Part D: Reception of Solicit message with DUID-LL

10. Enable DHCPv6 on the NUT.
11. TN1 transmits a Solicit message using DUID-LL.
12. Observe the messages transmitted on Link A.

Part E: NoPrefixAvail status

13. Enable DHCPv6 on the NUT and configure the NUT's prefix pool with no prefix available.
14. TN1 transmits a properly formatted Solicit message including an IA_PD option with a Prefix option.
15. Observe the messages transmitted on Link A.

Part F: Reception an IA_PD option with an invalid T1, T2 time

16. Enable DHCPv6 on the NUT.
17. TN1 transmits a properly formatted Solicit message including an IA_PD option with T1 = 80s, T2 = 50s.
18. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must not transmit any Advertise message in the response to the Solicit message**.**
- *Part B*

Step 6: The NUT transmits Advertise message with Client ID option same as the Solicit message**.**

- *Part C*

  Step 9: The NUT transmits Advertise message with Client ID option same as the Solicit message**.**

- *Part D*

  Step 12: The NUT transmits Advertise message with Client ID option same as the Solicit message**.**

- *Part E*

  Step 15: The NUT transmits a properly formatted Advertise message containing the IA_PD option with the status "*NoPrefixAvail*".

- *Part F*

  Step 18: The NUT transmits should ignore the invalid values of T1 and T2 and processes the IA_PD with T1 and T2 be set to 0.

Possible Problems:

- None.

Test DHCP_CONF.11.3.2 Reception of Request messages

Purpose: To verify a delegating router transmits properly formatted Reply messages for Request message of Prefix Delegation.

References:

- [DHCP 3633] – Section 12.2
- [DHCP 3315] – Section 18.2.1

Test Setup: Connect the network as described in the Common Topology. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Reception of Request message via unicast

1. TN1 transmits a valid Solicit message on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a Request message with unicast destination address to NUT.
3. Observe the messages transmitted on Link A.

Part B: Reception of valid Request message

4. TN1 transmits a valid Solicit message with an IA_PD option on Link A.
5. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message.
6. Observe the messages transmitted on Link A.

Part C: Reception of invalid Request message (with prefer lifetime >valid lifetime)

7. TN1 transmits a valid Solicit message with an IA_PD option on Link A.
8. After the reception of an Advertise message from the NUT, TN1 transmits an invalid Request message with prefer lifetime set to 100s and valid lifetime set to 120s.
9. Observe the messages transmitted on Link A.

Part D: Reception of invalid Request message (with T1>T2)

10. TN1 transmits a valid Solicit message with an IA_PD option on Link A.
11. After the reception of an Advertise message from the NUT, TN1 transmits an invalid Request message with T1 set to 80s and T2 set to 50s.
12. Observe the messages transmitted on Link A.

Part E: Reception of twice Request messages

13. TN1 transmits a valid Solicit message an IA_PD option on Link A.
14. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with IA_PD option on Link A.
15. Observe the messages transmitted on Link A.
16. After the reception of a Reply message from the NUT, TN1 transmits a valid Request message with IA_PD option on Link A.
17. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.
- *Part B*
  Step 6: The NUT transmits a valid Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_PD option.
- *Part C*
  Step 9: The NUT ignores the requirement for prefer lifetime and valid lifetime from TN1.
- *Part D*
  Step 12: The NUT ignores the requirement for T1 time and T2 time from TN1.
- *Part E*
  Step 15: The NUT transmits a valid Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option.
  Step 17: The NUT transmits a valid Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, and IA_NA option that same as Step 15's IA_NA option.

Possible Problems:

- None.

Test DHCP_CONF.11.3.3: Reception of Renew Messages for Prefix Delegation

Purpose: To verify a delegating router transmits properly formatted Reply messages for Renew message of Prefix Delegation.

References:

- [DHCP 3633] – Section 12.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Receive a renew message to update a valid prefix

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Renew message including an IA_PD option and valid IA Prefix option to NUT.
3. Observe the messages transmitted on Link A.

Part B: Receive a renew message to update lifetime

4. Enable DHCPv6 on the NUT and configure T1 = 50s, T2 =80s.
5. TN1 transmits a Solicit message including an IA_PD option, after receive an Advertise message. TN1 transmits a Request message then receive a Reply message with TN1 = 50s, TN2 = 80s.
6. Change the TN1 = 60s, TN2 = 90s in the NUT.
7. After 50s, TN1 transmits a Renew message including an IA_PD option and valid IA Prefix option to NUT.
8. Observe the messages transmitted on Link A.

Part C: Receive a renew message with a invalid prefix

9. Enable DHCPv6 on the NUT.
10. TN1 transmits a Renew message including an IA_PD option and invalid IA Prefix option to NUT.
11. Observe the messages transmitted on Link A.

Part D: Reception of Renew message with invalid IA_NA Identifier

12. Enable DHCPv6 on the NUT.
13. TN1 transmits a Renew message including an IA_PD option with invalid Identifier and IA Prefix option.
14. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Reply message with an IA_PD option containing the following values:
    - the same IAID as in Step 2
    - a Prefix option containing the same IPv6 Prefix as in the Renew message sent in Step 2

- *Part B*

Step 8: The NUT transmits a properly formatted Reply message with an IA_PD option containing the following values:

- the same IAID as in Step 2
- a Prefix option containing the same IPv6 Prefix as in the Renew message sent in Step 2
- TN1 = 60s, TN2 = 90s.

- *Part C*

  Step 11: The NUT transmits a properly formatted Reply message with an IA_PD with a status code option "Nobinding"

- *Part D*

  Step 14: The NUT transmits a Reply message containing a Status Code option with the value NoBinding, a Server Identifier option, the Client Identifier option from the TN1 message, and not include any IA Address options.

Possible Problems:

- None

Test DHCP_CONF.11.3.4: Reception of Rebind Messages for Prefix Delegation

Purpose: To verify a delegating router transmits properly formatted Reply messages for Rebind message of Prefix Delegation.

References:

- [DHCP 3633] – Section 12.2
- [DHCP 3315] – Sections 18.1.2 and 18.1.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Reception of Rebind message via unicast

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Rebind message including an IA_NA option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Receive a rebind message with a valid prefix

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Rebind message including an IA_PD option and valid IA Prefix option to NUT.
6. Observe the messages transmitted on Link A.

Part C: Receive a rebind message with a invalid prefix

7. Enable DHCPv6 on the NUT.
8. TN1 transmits a Rebind message including an IA_PD option and invalid IA Prefix option to NUT.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must not transmit any Reply message in the response to the Rebind message.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message with an IA_PD option containing the following values:
  - the same IAID as in Step 2
  - a Prefix option containing the same IPv6 Prefix as in the Rebind message sent in Step 2
- *Part C*

  Step 9: The NUT transmits a properly formatted Reply message with an IA_PD with the lifetime set to zero.

Possible Problems:

- None

Test DHCP_CONF.11.3.5: Reception of Release Messages for Prefix Delegation

Purpose: To verify a delegating router transmits properly formatted Reply messages for Release message of Prefix Delegation.

References:

- [DHCP 3633] – Section 12.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Reception of Release message via unicast

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Release message including an IA_PD option and IA Address option with unicast destination address to NUT.
3. Observe the messages transmitted on Link A

Part B: Reception of valid Release message

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Release message including an IA_PD option and valid IA Prefix option to NUT.
6. Observe the messages transmitted on Link A.

Part C: Reception of Release message with invalid IA_PD Identifier

7. Enable DHCPv6 on the NUT.
8. TN1 transmits a Release message including two IA_PD options with invalid Identifier and IA Prefix option.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a Reply message containing a Status Code option with the value UseMulticast, a Server Identifier option, the Client Identifier option from the TN1 message, and no other options.
- *Part B*

  Step 6: The NUT transmits a properly formatted Reply message containing a Status Code option with the value Success(or without a Satus Code option), a Server Identifier option and the Client Identifier option from the TN1 message. The NUT mark any prefix(es) in IA_PD Prefix options in the Release message from a requesting router as "available".
- *Part C*

  Step 9: The NUT transmits a Reply message containing a Status Code option with the value NoBinding in the each IA_NA option(No other options are included in the IA_NA option), a Server Identifier option, the Client Identifier option from the TN1 message, and a Status Code option with the value Success.

Possible Problems:

- None

Test DHCP_CONF.11.3.6: Reception of Relay-forward Messages for Prefix Delegation

Purpose: To verify that the delegating router transmits properly formatted Reply messages for Relay forward message of Prefix Delegation.

References:

- [DHCP 3633] – Section 12.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Receive a valid relay-forward message

1. TN5 transmits a valid Relay-forward Solicit message on Link A.
2. After the reception of a Relay-Reply Advertise message, TN5 transmits a valid Relay-forward Request message on Link A.
3. Observe the messages transmitted on Link A.

Part B: Receive a valid layered relay-forward message

4. TN5 transmits a valid Relay-forward Solicit message on Link A.
5. After the reception of a Relay-Reply Advertise message, TN7 transmits a valid Relay-forward Relay-forward Request message on Link A.
6. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted relay-reply message.

Step 6: The NUT transmits a properly formatted relay-reply message.

Possible Problems:

- None

Test DHCP_CONF.11.3.7: Reception of Invalid Solicit message

Purpose: To verify a server device properly handles the reception of invalid Solicit messages.

References:

- [DHCP 3315] – Sections 15 and 15.2

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Contains Server Identifier option

1. TN1 transmits a Solicit message that contains a Server Identifier option.
2. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

3. TN1 transmits a Solicit message that does not contain a Client Identifier option.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the Solicit message. The NUT must not send an Advertise message based on the received Solicit message.
- *Part B*

  Step 4: The NUT must silently discard the Solicit message. The NUT must not send an Advertise message based on the received Solicit message.

Possible Problems:

- None.

Test DHCP_CONF.11.3.8: Reception of Invalid Request message

Purpose: To verify a server device properly handles the reception of invalid Request messages.

References:

- [DHCP 3315] – Sections 15 and 15.4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. TN1 transmits a valid Solicit message on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a Request message that does not contain a Server Identifier option.
3. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

4. TN1 transmits a valid Solicit message on Link A.
5. After the reception of an Advertise message from the NUT, TN1 transmits a Request message that does not contain a Client Identifier option.
6. Observe the messages transmitted on Link A.

Part C: Server Identifier that does not match the DUID of the server

7. TN1 transmits a valid Solicit message on Link A.
8. After the reception of an Advertise message from the NUT, TN1 transmits a properly formatted Request message. The Request message contains a Server Identifier option whose value does not match the server's DUID.
9. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.
- *Part B*

  Step 6: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.
- *Part C*

  Step 9: The NUT must silently discard the Request message. The NUT must not send a Reply message based on the received Request message.

Possible Problems:

- None.

Test DHCP_CONF.11.3.9: Reception of Invalid Renew message

Purpose: To verify a server device properly handles the reception of invalid Renew messages.

References:

- [DHCP 3315] – Sections 15 and 15.6

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. TN1 transmits a Renew message including an IA_PD option with an IA Prefix option and without a Server Identifier option.
2. Observe the messages transmitted on Link A

Part B: No Client Identifier option

3. TN1 transmits a Renew message including an IA_PD option with an IA Prefix option and without a Client Identifier option.
4. Observe the messages transmitted on Link A

Part C: Server Identifier that does not match the DUID of the server

5. TN1 transmits a Renew message including an IA_PD option with an IA Prefix option and a Sever Identifier option whose value does not match the server's DUID.
6. Observe the messages transmitted on Link A

Observable Results:

- *Part A*
  Step 2: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.
- *Part B*
  Step 4: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.
- *Part C*
  Step 6: The NUT must silently discard the Renew message. The NUT must not send a Reply message based on the received Renew message.

Possible Problems:

- None.

Test DHCP_CONF.11.3.10: Reception of Invalid Rebind message

Purpose: To verify a server device properly handles the reception of invalid Rebind messages.

References:

- [DHCP 3315] – Sections 15 and 15.7

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: Contains Server Identifier option

1. TN1 transmits a Rebind message including an IA_PD option with an IA Prefix option and a Server Identifier option.
2. Observe the messages transmitted on Link A.

Part B: No Client Identifier option

3. TN1 transmits a Rebind message including an IA_PD option with an IA Prefix option and without a Client Identifier option.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 2: The NUT must silently discard the Rebind message. The NUT must not send a Reply message based on the received Rebind message.
- *Part B*
  Step 4: The NUT must silently discard the Rebind message. The NUT must not send a Reply message based on the received Rebind message.

Possible Problems:

- None.

Test DHCP_CONF.11.3.11: Reception of Invalid Release message

Purpose: To verify a server device properly handles the reception of invalid Release messages.

References:

- [DHCP 3315] – Sections 15 and 15.9

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is enabled on the server device before each part. DHCPv6 on the server device is disabled after each part.

Procedure:

Part A: No Server Identifier option

1. TN1 transmits a Release message including an IA_PD option with an IA Prefix option and without a Server Identifier option.
2. Observe the messages transmitted on Link A

Part B: No Client Identifier option

3. TN1 transmits a Release message including an IA_PD option with an IA Prefix option and without a Client Identifier option.
4. Observe the messages transmitted on Link A

Part C: Server Identifier that does not match the DUID of the server

5. TN1 transmits a Release message including an IA_PD option with an IA Prefix option and a Sever Identifier option whose value does not match the server's DUID.
6. Observe the messages transmitted on Link A

Observable Results:

- *Part A*

  Step 2: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.
- *Part B*

  Step 4: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.
- *Part C*

  Step 6: The NUT must silently discard the Release message. The NUT must not send a Reply message based on the received Release message.

Possible Problems:

- None.

Test DHCP_CONF.11.3.12: Server Messages Validation

Purpose: To verify that the delegating router properly handles the reception of invalid messages for Prefix Delegation.

References:

- [DHCP 3633] – Section 12.1

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is disabled on the NUT after each part.

Procedure:

Part A: Receive a confirm message

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a confirm message including an IA_NA option to NUT.
3. Observe the messages transmitted on Link A.

Part B: Receive a decline message

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a decline message including an IA_NA option to NUT.
6. Observe the messages transmitted on Link A.

Part C: Advertise message (type 2)

7. TN1 transmits an Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
8. Observe the messages transmitted on Link A.

Part D: Reply message (type 7)

9. TN1 transmits an Reply message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
10. Observe the messages transmitted on Link A.

Part E: Relay-reply message (type 13)

11. TN1 transmits a Relay Reply Advertise message to the "All_DHCP_Relay_Agents_and_Servers" multicast address (FF02::1:2) port 547.
12. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 3: The NUT must not reply any message.
- *Part B*
  Step 6: The NUT must not reply any message.
- *Part C*
  Step 8: The NUT discards the Advertise message from TN1 and does not transmit any packets.
- *Part D*
  Step 10: The NUT discards the Reply message from TN1 and does not transmit any packets.
- *Part E*

Step 12: The NUT discards the Relay Reply message from TN1 and does not transmit any packets.

Possible Problems:

- None

Section 12: RFC 3646 – Requesting Router (Client) Specification

Scope

The following tests cover specifications for the Requesting Router (client) implementation of the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 3646.
These tests verify the process for receiving a list of available DNS recursive name servers and a domain search list from a server in parallel with Address Assignment.

Overview

These tests are designed to verify the readiness of a DHCPv6 Requesting Router (client) implementation vis-à-vis the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 specification (Other configuration information function concurrently processing Address Assignment).

Test DHCP_CONF.12.1.1: Option Request Option Format

Purpose: To verify that the DHCPv6 Requesting Router (client) transmits the correct Option Request Option format.

References:

- [DHCP 3633] – Section 9 and 10,11
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Option Request Option Format (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Observe the messages transmitted on Link A.

Part B: Option Request Option Format (Domain Search List option)

3. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to DNS Recursive Name Server Option (23)
- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing the following Option Request Option values:
  - An option-code set to OPTION__ORO (6)
  - An option-length set to 2 * number of requested options
  - A requested-option-code-n set to Domain Search List option (24)

Possible Problems:

- None.

Test DHCP_CONF.12.1.2: Transmission of Solicit Messages for DNS Configuration options

Purpose: To verify a Requesting Router (client) device transmits properly formatted Solicit messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10,11
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 on the client device is disabled after each part.

Procedure:

Part A: Solicit message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Observe the Solicit message transmitted on Link A.

Part B: Solicit message format with Option Request Option (Domain Search List option)

3. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
4. Observe the Solicit message transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Solicit message containing an IA_PD option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 4: The NUT transmits a properly formatted Solicit message containing an IA_PD option and an Option Request option (Domain Search List option).

Possible Problems:

None.

Test DHCP_CONF.12.1.3: Transmission of Request messages for DNS Configuration options

Purpose: To verify that a Requesting Router (client) device transmits properly formatted Request messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10,11
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Request message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
3. Observe the messages transmitted on Link A.

Part B: Request message format with Option Request Option (Domain Search List option)

4. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
5. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Request message containing an IA_PD option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 6: The NUT transmits a properly formatted Request message containing an IA_PD option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.12.1.4: Transmission of Renew messages for DNS Configuration options

Purpose: To verify a Requesting Router (client) device transmits properly formatted Renew messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10,12
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Renew message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message (TR1 sets T1 to 50s and T2 to 80s).
4. After time T1 observe the messages transmitted Link A.

Part B: Renew message format with Option Request Option (Domain Search List option).

5. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
6. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
7. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message (TN1 sets T1 to 50s and T2 to 80s).
8. After time T1 observe the messages transmitted Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Renew message containing an IA_PD option and an Option Request option (DNS Recursive Name Server option).
- *Part B*

  Step 8: The NUT transmits a properly formatted Renew message containing an IA_PD option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.12.1.5: Transmission of Rebind message for DNS Configuration options

Purpose: To verify a Requesting Router (client) device transmits properly formatted Rebind messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10,12
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Rebind message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message (TR1 sets T1 to 50s and T2 to 80s).
4. TN1 does not respond to any Renew messages transmitted after T1.
5. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Part B: Rebind message format with Option Request Option (Domain Search List option)

6. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message (TR1 sets T1 to 50s and T2 to 80s).
9. TN1 does not respond to any Renew messages transmitted after T1.
10. After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.

Observable Results:

- *Part A*
  Step 5: The NUT transmits a properly formatted Rebind message containing an IA_PD option and an Option Request option (DNS Recursive Name Server option).
- *Part B*
  Step 10: The NUT transmits a properly formatted Rebind message containing an IA_PD option and an Option Request option (Domain Search List option).

Possible Problems:

- None.

Test DHCP_CONF.12.1.6: Transmission of Release messages for DNS Configuration options

Purpose: To verify a Requesting Router (client) device transmits properly formatted Release messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10,12
- [DHCP 3646] – Section 3, 4 and 5

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to require DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Release message format with Option Request Option (DNS Recursive Name Server option)

1. Enable DHCPv6 which is configured to require a DNS Recursive Name Server option in parallel with Prefix Assignment on the NUT.
2. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
3. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message.
4. Configure the client to release the IPv6 address.
5. Observe the messages transmitted on Link A.

Part B: Release message format with Option Request Option (Domain Search List option)

6. Enable DHCPv6 which is configured to require a Domain Search List option in parallel with Prefix Assignment on the NUT.
7. Upon the reception of a Solicit message from the NUT, TR1 transmits a properly formatted Advertise message.
8. Upon the reception of a Request message from the NUT, TR1 transmits a properly formatted Reply message.
9. Configure the client to release the IPv6 address.
10. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 5 The NUT transmits a properly formatted Release message containing an IA_PD option and the Release message must not contain a DNS Recursive Name Server option.
- *Part B*

  Step 10: The NUT transmits a properly formatted Release message containing an IA_PD option and the Release message must not contain a Domain Search List option.

Possible Problems:

- None.

Section 13: RFC 3646 – Delegating Router (Server) Specification

Scope

The following tests cover specifications for the Delegating Router (Server) implementation of the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request for Comments 3646. These tests verify the process for passing a list of available DNS recursive name servers and a domain search list to a Requesting Router (client) in parallel with Prefix Assignment.

Overview

These tests are designed to verify the readiness of a Delegating Router (Server) implementation vis-à-vis the DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 specification (Other configuration information function concurrently processing Prefix Assignment).

Test DHCP_CONF.13.1.1: DNS Recursive Name Server Option Format

Purpose: To verify the Delegating Router (Server) transmits the correct DNS Recursive Name Server Option format.

References:

- [DHCP 3646] – Section 3

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following DNS Recursive Name Server option values:

- An option-code set to OPTION_DNS_SERVERS(23)
- An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
- DNS-recursive-name-server set to IPv6 address of DNS recursive name server

Possible Problems:

- None.

Test DHCP_CONF.13.1.2: Domain Search List Option Format

Purpose: To verify the Delegating Router (Server) transmits the correct Domain Search List Option format.

References:

- [DHCP 3646] – Section 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. DHCPv6 is disabled on the server device after each part.

Procedure:

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_PD option and an Option Request Option (Domain Search List Option).
3. Observe the messages transmitted on Link A.

Observable Results:

Step 3: The NUT transmits a properly formatted Advertise message containing the following Domain Search List option values:

- An option-code set to OPTION_DOMAIN_LIST(24)
- An option-length set to the length of the 'search list' field in octets
- DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.13.1.3: Configuration of DNS options

Purpose: To verify the Delegating Router (Server) transmits a message with correctly configured DNS option

References:

- [DHCP 3633] – Section 9,10 and 11
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide only DNS Recursive Name Server option in parallel with Prefix Assignment in part A. DHCPv6 is configured to provide DNS Recursive Name Server option and DNS Domain Search List Option in parallel with Prefix Assignment in part B. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Returning of DNS Recursive Name Server option

1. Enable DHCPv6 on the NUT.
2. TN1 transmits a Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
3. Observe the messages transmitted on Link A.

Part B: Returning of DNS Recursive Name Server option and Domain Search List Option

4. Enable DHCPv6 on the NUT.
5. TN1 transmits a Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server Option and Domain Search List Option).
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 3: The NUT transmits a properly formatted Advertise message containing only a DNS Recursive Name Server option.
- *Part B*

  Step 6: The NUT transmits a properly formatted Advertise message containing a DNS Recursive Name Server option and a Domain Search List Option.

Possible Problems:

- None.

Test DHCP_CONF.13.1.4: Transmission of Advertise Messages for DNS Configuration options

Purpose: To verify a Delegating Router (Server) device transmits Advertise messages in response to Solicit messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9,10 and 11
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Advertise message in response to Solicit message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. Observe the messages transmitted on Link A.

Part B: Advertise message in response to Solicit message with ORO (Domain Search List option)

3. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (Domain Search List Option).
4. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Advertise message containing the following elements:
    - Destination address set to TN1's unicast address same as the Solicit message's source address
    - A msg-type field set to ADVERTISE (2)
    - A transaction-id set to the same as the Solicit message's transaction-id
    - A Server Identifier option (containing a DUID)
    - A Client Identifier option set to the same as Solicit message's Client Identifier option
    - A DNS Recursive Name Server option set to the following values:
        - An option-code set to OPTION_DNS_SERVERS(23)
        - An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
        - DNS-recursive-name-server set to IPv6 address of DNS recursive name server
- *Part B*

  Step 4: The NUT transmits a properly formatted Advertise message containing the following elements:

- Destination address set to TN1's unicast address same as the Solicit message's source address
- A msg-type field set to ADVERTISE (2)
- A transaction-id set to the same as Solicit message's transaction-id
- A Server Identifier option (containing a DUID)
- A Client Identifier option set to the same as Solicit message's Client Identifier option
- A Domain Search List option set to the following values:
  - An option-code set to OPTION_DOMAIN_LIST(24)
  - An option-length set to the length of the 'searchlist' field in octets
  - DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.13.1.5: Transmission of Reply Messages for DNS Configuration options

Purpose: To verify a Delegating Router (Server) device transmits Reply messages in response to Request messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9,10 and 12
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reply message in response to Request message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. Observe the messages transmitted on Link A.

Part B: Reply message in response to Request message with ORO (Domain Search List option)

4. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (Domain Search List Option).
5. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (Domain Search List Option) on Link A.
6. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 2: The NUT transmits a properly formatted Reply message containing the following elements:
  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - A DNS Recursive Name Server option set to the following values:
    - An option-code set to OPTION_DNS_SERVERS(23)

- An option-length set to the length of the list of DNS recursive name servers in octets; must be a multiple of 16
- DNS-recursive-name-server set to IPv6 address of DNS recursive name server

- *Part B*

  Step 4: The NUT transmits a properly formatted Reply message containing the following elements:

  - Destination address set to TN1's unicast address same as the Request message's source address
  - A msg-type field set to REPLY(7)
  - A transaction-id set to the same as the Request message's transaction-id
  - A Server Identifier option (containing a DUID)
  - A Client Identifier option set to the same as Request message's Client Identifier option
  - A Domain Search List option set to the following values:
    - An option-code set to OPTION_DOMAIN_LIST(24)
    - An option-length set to the length of the 'searchlist' field in octets
    - DNS-recursive-name-server set to the specification of the list of domain names in the Domain Search List

Possible Problems:

- None.

Test DHCP_CONF.13.1.6 Reception of Renew messages for DNS Configuration options

Purpose: To verify a Delegating Router (Server) device properly handles the reception of Renew messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9 and 10, 12
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reception of Renew message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. After the reception of a Reply message from the NUT, TN1 transmits a valid Renew message including an IA_PD option with IA Prefix option and Option Request Option (DNS Recursive Name Server option) on Link A.
4. Observe the messages transmitted on Link A.

Part B: Reception of Renew message with ORO (Domain Search List option)

5. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (Domain Search List option) on Link A.
6. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (Domain Search List option) on Link A.
7. After the reception of a Reply message from the NUT, TN1 transmits a valid Renew message including an IA_PD option with IA Prefix option and Option Request Option (Domain Search List option) on Link A.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_PD option with IA Prefix Delegation option and DNS Recursive Name Server option.
- *Part B*

  Step 8: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_PD option with IA Prefix option and Domain Search List option.

Possible Problems:

- None.

Test DHCP_CONF.13.1.7 Reception of Rebind messages for DNS Configuration options

Purpose: To verify a Delegating Router (Server) device properly handles the reception of Rebind messages for DNS Configuration options.

References:

- [DHCP 3633] – Section 9, 10 and 12
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. DHCPv6 is configured to provide DNS Configuration option in parallel with Prefix Assignment. Enable DHCPv6 on the server device before each part. DHCPv6 is disabled on the server device after each part.

Procedure:

Part A: Reception of Rebind message with ORO (DNS Recursive Name Server option)

1. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
2. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (DNS Recursive Name Server option) on Link A.
3. After the reception of a Reply message from the NUT, TN1 transmits a valid Rebind message including an IA_PD option with IA Prefix option and Option Request Option (DNS Recursive Name Server option) on Link A.
4. Observe the messages transmitted on Link A.

Part B: Reception of Rebind message with ORO (Domain Search List option)

5. TN1 transmits a valid Solicit message with an IA_PD option and an Option Request Option (Domain Search List option) on Link A.
6. After the reception of an Advertise message from the NUT, TN1 transmits a valid Request message with an IA_PD option and an Option Request Option (Domain Search List option) on Link A.
7. After the reception of a Reply message from the NUT, TN1 transmits a valid Rebind message including an IA_PD option with IA Prefix option and Option Request Option (Domain Search List option) on Link A.
8. Observe the messages transmitted on Link A.

Observable Results:

- *Part A*

  Step 4: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_PD option with IA Prefix option and DNS Recursive Name Server option.
- *Part B*

  Step 8: The NUT transmits a properly formatted Reply message containing a Server Identifier option, the Client Identifier option from the TN1 message, IA_PD option with IA Prefix option and Domain Search List option.

Possible Problems:

- None.