IPv6 Ready

DHCPv6 Test Specification

Technical Document

Revision 2.0.0b

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

Table of Contents

Acknowledgements

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Principle Authors:

Yokogawa Electric Corporation
University of New Hampshire - InterOperability Lab

Commentators:

IRISA-INRIA
BII Group
TTA/IT Testing Laboratory
Ralph Droms
Bernie Volz

Introduction

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

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

Definitions

DAD	Duplicate Address Detection (DAD)
DHCP	Dynamic Host Configuration Protocol
DUID	DHCP Unique Identifier
NUT	Node Under Test
IA	Identify Association
ID	Identifier
TN	Testing Node
TR	Test Router
Client	DHCPv6 Client Device
Server	DHCPv6 Server Device
RelayAgent	DHCPv6 Relay Agent Device
RR	Requesting Router
DR	Delegating Router

Test Organization

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

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

References

The following documents are referenced in these texts:

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

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

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

General Node Requirements

To obtain the IPv6 Ready Logo Phase-2 for DHCPv6, the client, server and relay agent must satisfy all of the following requirements.

Equipment Type

There are five 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.

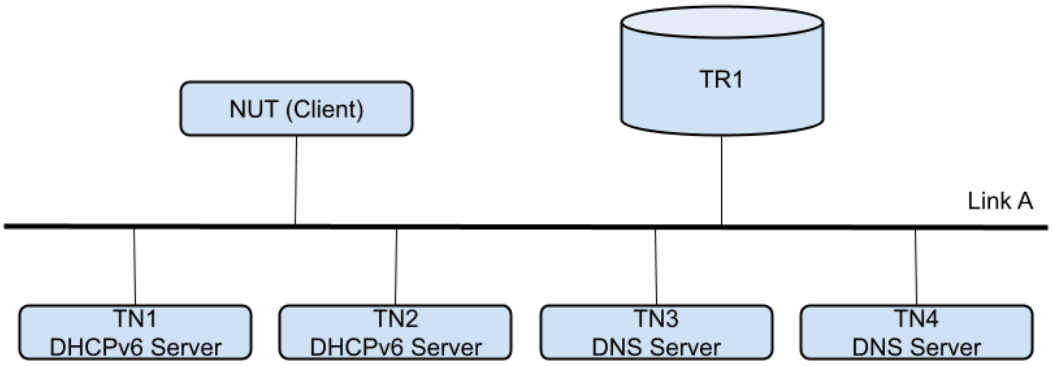
DHCP relay agent (or relay agent):

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)

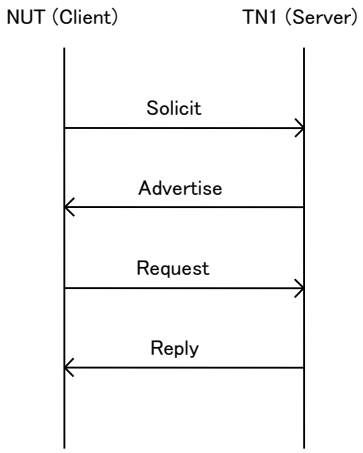


Common Test Setup

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

Common Test Setup 1.1 IA_NA and/or IA_PD

Summary: This minimal setup procedure describes a proper Solicit - Advertise - Request - Reply exchange between the NUT and TN1 for a client. After that, NUT also uses a RA to configure the prefix to the TN1.



Step	Action	Expected Behavior
1.	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). The Solicit can contain an IA_NA and/or IA_PD option
2.	TN1 responds with an Advertise message.	The NUT then sends a Request message to TN1 asking for confirmed assignment of addresses and/or prefixes and other configuration information.
3.	TN1 responds with a Reply message that contains the confirmed addresses and/or prefixes and configuration. The Reply message contains all IA options with T1 set to 50 seconds and T2 set to 80 seconds.	
4.	If the NUT did not request an IA_NA address, TR1 transmits an RA containing the prefix for Link A. A static global address may be configured on the NUT if it does not support SLAAC.	The NUT uses SLAAC or static configuration to obtain a global address.

Common Test Setup 1.2 IA_NA

Step	Action	Expected Behavior
1.	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). The Solicit must contain an IA_NA option.
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.
3.	TN1 responds with a Reply message that contains the confirmed addresses and configuration. The Reply message contains all IA options with T1 set to 50 seconds and T2 set to 80 seconds.	

Common Test Setup 1.3 IA_PD

Step	Action	Expected Behavior
1.	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). The Solicit must contain an IA_PD option.
2.	TN1 responds with an Advertise message.	The NUT then sends a Request message to TN1 asking for confirmed assignment of prefixes and other configuration information.
3.	TN1 responds with a Reply message that contains the confirmed prefixes and configuration. The Reply message contains all IA options with T1 set to 50 seconds and T2 set to 80 seconds.	
4.	If the NUT did not request an IA_NA address, TR1 transmits an RA containing the prefix for Link A. A static global address may be configured on the NUT if it does not support SLAAC.	The NUT uses SLAAC or static configuration to obtain a global address.

Common Test Setup 1.4 IA_NA and IA_PD

Step	Action	Expected Behavior
1.	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). The Solicit can contain an IA_NA and an IA_PD option
2.	TN1 responds with an Advertise message.	The NUT then sends a Request message to TN1 asking for confirmed assignment of addresses and prefixes and other configuration information.
3.	TN1 responds with a Reply message that contains the confirmed addresses and prefixes and configuration. The Reply message contains all IA options with T1 set to 50 seconds and T2 set to 80 seconds.	

Advanced Functionality Tests

TBD

Section 1: DHCPv6 Client – IA Agnostic

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 8415.
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 test cases in this section pertain to the base functionality of DHCPv6, rather than functionality specifically related to the type of IA that is assigned. Each test can be run with the client configured to request an IA_NA or IA_PD.

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 8415 when grouping based on considerations of test setup and procedure is applied.

Overview

These tests are designed to verify the readiness of DHCPv6 client, server and relay agent interoperability 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: 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.

Reference:

- [8415] – Section 18
- [3646] – Section 3

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

Procedure:

Part A: Multicast Addresses

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	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: Valid UDP port

Step	Action	Expected Behavior
3.	Enable DHCPv6 on the NUT.	
4.	Observe the messages transmitted on Link A.	The NUT must transmit a Solicit message with a destination UDP port set to 547.
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.	The NUT must process the correct Advertise message and transmit a Request Message to TN1.

Part C: Invalid UDP port

Step	Action	Expected Behavior
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.	The NUT must not transmit a DHCPv6 Request Message and 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.1.1.2: Client Message Format

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

Reference:

- [8415] – Section 8

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing the following elements: • The msg-type field was set to the value of 1 (Solicit)

Possible Problems:

- None.

Test DHCP_Conf.1.1.3: Client Identifier Option Format

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

Reference:

- [8415] – Section 21.2

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	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.1.1.4: Client DHCP Unique Identifier Contents

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

Reference:

- [8415] – Sections 11.2, 11.3, 11.4 and 11.5

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 Format

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing a DUID Option. The option has: • An option-code set to OPTION_CLIENTID(1) • An option-length set to the length of DUID in octets • A valid DUID Value.

Part B: DUID Consistency

Step	Action	Expected Behavior
3.	Enable DHCPv6 on the NUT.	
4.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing a DUID Option.
5.	Reboot the NUT.	
6.	Enable DHCPv6 on the NUT.	
7.	Observe the messages transmitted on Link A.	The NUT must transmit a Solicit message with the identical DUID option containing the same values as in Step 4.

Possible Problems:

- None

Test DHCP_Conf.1.1.5: Server Identifier Option Format

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

Reference:

- [8415] – Section 21.3

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message.
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.	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.1.1.6: Elapsed Time Option Format

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

Reference:

- [8415] – Sections 21.9, 7.6, and 15

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

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the First Solicit message transmitted on Link A.	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 zero

Part B: Elapsed Time Option in Request message

Step	Action	Expected Behavior
3.	Enable DHCPv6 on the NUT.	
4.	Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.	
5.	Observe the first Request message transmitted on Link A.	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 zero

Part C: Elapsed Time Option in Renew message

Step	Action	Expected Behavior
6.	Common Test Setup 1.1 is performed with the values T1=50s and T2=2500s (preferred lifetime and valid lifetime are greater than T1 and T2).	

7.	The NUT should have received IPv6 address or prefix 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).	
8.	After time T1, observe the message transmitted on Link A.	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 zero

Part D: Elapsed Time Option in Rebind message

Step	Action	Expected Behavior
9.	Common Test Setup 1.1 is performed.	
10.	TN1 does not respond to any Renew messages transmitted after T1.	
11.	After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.	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 zero

Part E: Elapsed Time Option in Release message

Step	Action	Expected Behavior
12.	Common Test Setup 1.1 is performed.	
13.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
14.	Configure the client to release the IPv6 address or prefix.	
15.	Observe the messages transmitted on Link A.	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 zero

Part F: Maximum Elapsed Time in elapsed-time field

Step	Action	Expected Behavior
16.	Common Test Setup 1.1 is performed with the values T1=50s and T2=2500s (preferred	

	lifetime and valid lifetime are greater than T1 and T2).	
17.	The NUT should have received IPv6 address or prefix 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).	
18.	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.	The NUT transmitted a first Renew message containing an Elapsed Time option with its elapsed-time value set to 0. The 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 transmitted. When the elapsed time was greater than 0xffff, the NUT transmitted a Renew with an Elapsed Time option with its elapsed-time value set to 0xffff.

Possible Problems:

- None.

Test DHCP_Conf.1.1.7: Option Request Option Format

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

Reference:

- [8415] – Sections 18.2.1, 21.7, and 21.24
- [3646] – Sections 3 and 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: DNS Recursive Name Server option

Step	Action	Expected Behavior
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.	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: Domain Search List option

Step	Action	Expected Behavior
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.	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)

Part C: SOL_MAX_RT option

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit messages 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 SOL_MAX_RT Option (82)

Part D: Option codes not included

Step	Action	Expected Behavior
7.	Enable DHCPv6 on the NUT.	
8.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit messages that does NOT contain the following Option Request Option values: • Client Identifier (1) • Server Identifier (2) • IA_NA (3) • IA_TA (4) • IA_PD (25) • IA Address (5) • IA Prefix (26) • Option Request (6) • Elapsed Time (8) • Preference (7) • Relay Message (9) • Authentication (11) • Server Unicast (12) • Status Code (13) • Rapid Commit (14) • User Class (15) • Vendor Class (16) • Interface-Id (18) • Reconfigure Message (19) • Reconfigure Accept (20) • Information Refresh Time (32)

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.

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.1, and 21.9

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

Retransmission Times:

Solicit Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmitted Solicit	1.00	1.10	1000	1100
2nd Retransmitted Solicit	1.90	2.31	2900	3410
3rd Retransmitted Solicit	3.61	4.85	6510	8261
4th Retransmitted Solicit	6.86	10.19	13369	18448
5th Retransmitted Solicit	13.03	21.39	26401	39841
6th Retransmitted Solicit	24.76	44.93	51162	84766
7th Retransmitted Solicit	47.05	94.34	98208	179109
8th Retransmitted Solicit	89.39	198.12	187595	377229
9th Retransmitted Solicit	169.84	416.05	357431	655350
10th Retransmitted Solicit	322.69	873.71	655350	655350
11th Retransmitted Solicit	613.11	1834.79	655350	655350
12th Retransmitted Solicit	1164.90	3853.05	655350	655350
13th Retransmitted Solicit	2213.31	3960.00	655350	655350
14th Retransmitted Solicit	3240.00	3960.00	655350	655350

Procedure:

Part A: Solicit message format

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the first Solicit message transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing the following elements:

		• 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 • An Option Request option with a requested-option-code-n set to SOL_MAX_RT Option (82)

Part B: Reliability of DHCPv6 Retransmission

Step	Action	Expected Behavior
3.	Enable DHCPv6 on the NUT.	
4.	Observe the first Solicit message transmitted on Link A.	The NUT transmits a properly formatted Solicit message.
5.	Wait for second Solicit message.	
6.	Observe the second Solicit message transmitted on Link A.	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: Retransmission of Solicit Message

Step	Action	Expected Behavior
7.	Enable DHCPv6 on the NUT.	
8.	Observe the time the first Solicit message was transmitted on Link A.	The NUT transmits a properly formatted Solicit message.
9.	Wait for second Solicit message.	
10.	Observe the time the second Solicit message was transmitted on Link A.	The NUT transmits a properly formatted Solicit message according to the Second message in the chart above.

Part D: Maximum Retransmission Time of Solicit Message

Step	Action	Expected Behavior
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.	The NUT transmits a properly formatted Solicit message according to the Second message in the chart above. The transaction ID is the same for all retransmitted messages.

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.	The NUT transmitted the first Solicit message containing an Elapsed Time option with its elapsed-time value set to 0. The NUT retransmitted the Solicit messages containing elapsed-time values set to the time elapsed since the first Solicit message was received. When the elapsed time was greater than 0xffff the NUT transmitted Solicit messages containing elapsed-time values set to 0xffff. The elapsed-time value of the Solicit messages must be in the range of the chart above.

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.

Reference:

- [8415] – Sections 15, and 18.2.1

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

Procedure:

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

Step	Action	Expected Behavior
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.	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: Receives Advertise message without Preference Option after first RT elapse

Step	Action	Expected Behavior
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.	The NUT must transmit a Request message immediately (less then 1.0 seconds) 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 15 of RFC 8415; 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.

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.2, and 21.9

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

Retransmission Times:

Request Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmition	0.90	1.10	900	1100
2nd Retransmition	1.71	2.31	2610	3410
3rd Retransmition	3.25	4.85	5859	8261
4th Retransmition	6.17	10.19	12032	18448
5th Retransmition	11.73	21.39	23761	39841
6th Retransmition	22.28	33.00	46046	72841
7th Retransmition	27.00	33.00	73046	105841
8th Retransmition	27.00	33.00	100046	138841
9th Retransmition	27.00	33.00	127046	171841
10th Retransmition	27.00	33.00	154046	204841

Procedure:

Part A: Request message format

Step	Action	Expected Behavior
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.	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 • An Option Request option with a requested-option-code-n set to SOL_MAX_RT Option (82)

Part B: Retransmission of Request messages

Step	Action	Expected Behavior
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.	The NUT transmits a properly formatted Request message according to the 1st retransmitted message in the above chart.

Part C: Maximum Retransmission Time of Request messages

Step	Action	Expected Behavior
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.	The NUT should properly transmit Request messages according to the above chart. The transaction ID is the same for all retransmitted messages. The elapsed-time value of these Request messages should be in the range of the above chart.

Part D: Maximum Retransmission Count of Request messages

Step	Action	Expected Behavior
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.	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.

Possible Problems:

- If REQ_MAX_RC means the max Retransmission count in RFC 8415, the expected behavor of Part D in Step 9 can be: The NUT must terminate the message exchange

after the transmission of one Request message and retransmission of REQ_MAX_RC (10) Request messages. The NUT must not transmit any more Request messages.

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts B, C, and D.

Test DHCP_Conf.1.2.4: Transmission of Renew messages

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

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.4, and 21.9

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

Retransmission Times:

Renew Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmition	9.00	11.00	9000	11000
2nd Retransmition	17.10	23.10	26100	34100
3rd Retransmition	32.49	48.51	58590	82610
4th Retransmition	61.73	101.87	120321	184481
5th Retransmition	117.29	213.93	237610	398410
6th Retransmition	222.85	449.25	460459	847661
7th Retransmition	423.41	660.00	883872	1507661
8th Retransmition	540.00	660.00	1423872	2167661
9th Retransmition	540.00	660.00	1963872	2827661
10th Retransmition	540.00	660.00	2503872	3487661

Procedure:

Part A: Renew message format

Step	Action	Expected Behavior
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 or 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).	
3.	After time T1 observe the messages transmitted Link A.	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 or Prefix Option with the proper IPv6 address or prefix associated with the IA. • An Elapsed Time Option • An Option Request option with a requested-option-code-n set to SOL_MAX_RT Option (82)

Part B: Retransmission of Renew message, T1 and T2 non-zero.

Step	Action	Expected Behavior
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 or 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).	
6.	Observe the messages transmitted on Link A until second Renew message received.	The NUT transmits properly formatted Renew message according to the 1st retransmitted message in the above chart.

Part C: Maximum Retransmission Time of Renew message, T1 and T2 non-zero.

Step	Action	Expected Behavior
7.	Common Test Setup 1.1 is performed before each part with the values T1=40s and T2=3000s.	
8.	The NUT should have received IPv6 address or prefix information from TN1. TN1 assigns the T1 and T2 parameters to the NUT's IA (TN1 sets T1 to 40s and T2 to 3000s).	
9.	Observe the messages transmitted on Link A for time T2.	The NUT should properly transmit Renew messages according to the above chart. The transaction ID is the same for all retransmitted messages. X+1 message that after T2 (3000 seconds) is not observed. The elapsed-time value of the Renew messages should be in the range of the above chart.

Part D: Maximum Retransmission Duration of Renew message, T1 and T2 non-zero.

Step	Action	Expected Behavior
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 or prefix 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.	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.

Part E: IA Lifetime 0

Step	Action	Expected Behavior
13.	Enable DHCPv6 on the NUT. Upon receipt of a Solicit message, TN1 sends a valid Advertise message that includes two IA Address or IA Prefix options. IA 1 has valid and preferred lifetimes set to 100 and 240. IA 2 has valid and preferred lifetimes set to 20 and 40. T1 is set to 50 and T2 is set to 80.	
14.	Upon receipt of the Request message, TN1 sends a valid Reply message containing the same information as step 13.	
15.	Observe the messages transmitted on Link A for time T1.	The NUT must transmit a Renew message that does not contain IA 2.

Possible Problems:

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts B and C.

Test DHCP_Conf.1.2.5: Transmission of Rebind messages

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

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.5, and 21.9

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.

Retransmission Times:

Rebind Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmition	9.00	11.00	9000	11000
2nd Retransmition	17.10	23.10	26100	34100
3rd Retransmition	32.49	48.51	58590	82610
4th Retransmition	61.73	101.87	120321	184481
5th Retransmition	117.29	213.93	237610	398410
6th Retransmition	222.85	449.25	460459	847661
7th Retransmition	423.41	660.00	883872	1507661
8th Retransmition	540.00	660.00	1423872	2167661
9th Retransmition	540.00	660.00	1963872	2827661
10th Retransmition	540.00	660.00	2503872	3487661

Procedure:

Part A: Rebind message format

Step	Action	Expected Behavior
1.	The NUT should have received IPv6 address or prefix 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.	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 or Prefix Option with the proper IPv6 address or prefix associated with the IA. • An Elapsed Time Option • An Option Request option with a requested-option-code-n set to SOL_MAX_RT Option (82)

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

Step	Action	Expected Behavior
4.	The NUT should have received IPv6 address or prefix information from TN1.	
5.	TN1 does not respond to any Renew 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 is received.	The NUT transmits properly formatted Rebind message according to the 1st retransmitted message in the above chart.

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

Step	Action	Expected Behavior
7.	The NUT should have received IPv6 address or prefix information with valid lifetime 3000s from TN1.	
8.	TN1 does not respond to any Renew messages transmitted after T1.	
9.	After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.	The NUT should properly transmit Rebind messages according to the above chart. The transaction ID is the same for all retransmitted messages. X+1 message that after valid lifetime (3000 seconds) is not observed. The elapsed-time value of the Renew messages should be in the range of the above chart.

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

Step	Action	Expected Behavior

10.	The NUT should have received IPv6 address or prefix information with valid lifetime 300s from TN1.	
11.	TN1 does not respond to any Renew messages transmitted after T1.	
12.	After time T2 (30s (T2-T1) after Renew message), observe the messages transmitted on Link A.	The NUT must terminate the message transmission of Rebind message after MRD (Remaining time until valid lifetimes of all addresses and prefixes 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:

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts B and C.

Test DHCP_Conf.1.2.6: 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.

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.7, and 21.9

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.

Retransmission Times:

Rebind Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmition	0.90	1.10	900	1100
2nd Retransmition	1.71	2.31	2610	3410
3rd Retransmition	3.25	4.85	5859	8261
4th Retransmition	6.17	10.19	12032	18448
5th Retransmition	11.73	21.39	23761	39841

Procedure:

Part A: Release message format

Step	Action	Expected Behavior
1.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
2.	Configure the client to release the IPv6 address or prefix.	
3.	Observe any messages transmitted on Link A.	The NUT transmits a properly formatted Release message to TN1 containing: • A source address, not equal to the tentative address in Step 1, if an IPv6 address was assigned. • 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/Prefix Option with the proper IPv6 address or prefix associated with the IA • An Elapsed Time Option

Part B: Retransmission of Release message

Step	Action	Expected Behavior
4.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
5.	Configure the client to release the IPv6 address or prefix.	
6.	Observe the messages transmitted on Link A until the second Release message is received.	The NUT transmits properly formatted Release message according to the 1st retransmitted message in the above chart.

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

Step	Action	Expected Behavior
7.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
8.	Configure the client to release the IPv6 address or prefix.	
9.	Observe any messages transmitted on Link A.	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.

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

Step	Action	Expected Behavior
10.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
11.	Configure the client to release the IPv6 address or prefix.	
12.	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.	
13.	Observe any messages transmitted on Link A.	The NUT ceases the transmission of Release messages upon reception of the Reply message from TN1.

Part E: Elapsed-time value of the retransmit Release message

Step	Action	Expected Behavior
14.	Verify that the NUT is configured with the received IPv6 address or prefix information from TN1.	
15.	Configure the client to release the IPv6 address or prefix.	
16.	Observe any messages transmitted on Link A.	The elapsed-time value of the Renew messages should be in the range of the above chart.

Possible Problems:

- If REL_MAX_RC means the max Retransmission count in RFC 8415, the expected behavior of Part C in Step 9 can be: The NUT must terminate the message exchange after the transmission of one Release message and retransmission of REL_MAX_RC (5) Release messages. The NUT must not transmit any more Release messages.
- If REL_MAX_RC means the max Retransmission count in RFC 8415, the 5th retransmission elapsed time values may be referenced for part E.
- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts B and C.
- The NUT may only transmit one Release message before the transmission timeout according to Section 18.2.7 in RFC 8415. Therefore the NUT may omit parts B, C, D, and E.

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 Reply messages

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

Reference:

- [8415] – Sections 18.2.10

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

Procedure:

Part A: Reply message contains UnspecFail

Step	Action	Expected Behavior
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.	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: Reply message contains UseMulticast

Step	Action	Expected Behavior
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.	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: Reply message contains NotOnLink in response to a Request message

Step	Action	Expected Behavior
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.	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: Reply message contains NoBinding in response to a Renew message

Step	Action	Expected Behavior
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, 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.	
15.	Observe the messages transmitted on Link A.	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 messages.

Part E: Reply message contains NoBinding in response to a Rebind message

Step	Action	Expected Behavior
16.	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).	
17.	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.	

18.	Observe any messages transmitted on Link A.	Upon reception of the Reply message from TN1, the NUT should transmit a Request message with a for each of the IAs that the NUT included in the Rebind message. The NUT must not send any additional Rebind messages.

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

Step	Action	Expected Behavior
19.	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).	
20.	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.	
21.	Observe the messages transmitted on Link A (Maximum for 30 seconds).	Upon reception of the Reply message from TN1, the NUT should transmit a Renew message. The NUT must rate-limit its retransmission of the Renew message.

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

Step	Action	Expected Behavior
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 Rebind message from the NUT, TN1 transmits a properly formatted Reply message that does not contain the IAs the NUT requested configuration.	
24.	Observe the messages transmitted on Link A.	Upon reception of the Reply message from TN1, the NUT should transmit a Rebind message. The NUT must rate-limit its retransmission of the Renew message.

Possible Problems:

- None.

Test DHCP_Conf.1.3.2: Processing SOL_MAX_RT Option

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

Reference:

- [8415] – Sections 7.6, 15, 18.2.1, and 21.24

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

Retransmission Times:

Solicit Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmission	1.00	1.10	1000	1100
2nd Retransmission	1.90	2.31	2900	3410
3rd Retransmission	3.61	4.85	6510	8261
4th Retransmission	6.86	10.19	13369	18448
5th Retransmission	13.03	21.39	26401	39841
6th Retransmission	24.76	44.93	51162	84766
7th Retransmission	47.05	94.34	98208	179109
8th Retransmission	89.39	198.12	187595	377229
9th Retransmission	169.84	330.00	357431	655350
10th Retransmission	270.00	330.00	627431	655350
11th Retransmission	270.00	330.00	655350	655350
12th Retransmission	270.00	330.00	655350	655350
13th Retransmission	270.00	330.00	655350	655350
14th Retransmission	270.00	330.00	655350	655350

Procedure:

Part A: SOL_MAX_RT Option set to 300

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	

2.	Upon reception of a DHCPv6 Solicit message TN1 transmits DHCPv6 Advertise message that contains a SOL_MAX_RT with a value of 300 seconds and status codes of NoAddrsAvail and/or NoPrefixAvail for all IA options.	
3.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit message according to the above chart.

Part B: SOL_MAX_RT Option less than 60

Step	Action	Expected Behavior
4.	Enable DHCPv6 on the NUT.	
5.	Upon reception of a DHCPv6 Solicit message TN1 transmits DHCPv6 Advertise message that contains a SOL_MAX_RT with a value of 45 seconds and status codes of NoAddrsAvail and/or NoPrefixAvail for all IA options.	
6.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit message according to the above chart.

Part C: SOL_MAX_RT Option greater than 86400

Step	Action	Expected Behavior
7.	Enable DHCPv6 on the NUT.	
8.	Upon reception of a DHCPv6 Solicit message TN1 transmits DHCPv6 Advertise message that contains a SOL_MAX_RT with a value of 87000 seconds and status codes of NoAddrsAvail and/or NoPrefixAvail for all IA options.	
9.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit message according to the above chart.

Part D: SOL_MAX_RT Option in Reply message

Step	Action	Expected Behavior
10.	Enable DHCPv6 on the NUT.	
11.	Upon reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.	

12.	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 and a SOL_MAX_RT option with a value of 300 seconds.	
13.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Solicit message according to the above chart.

Possible Problems:

- None.

Test DHCP_Conf.1.3.3: Reception of Advertise messages

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

Reference:

- [8415] – Section 18.2.9

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

Retransmission Times:

Solicit Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmission	1.00	1.10	1000	1100
2nd Retransmission	1.90	2.31	2900	3410
3rd Retransmission	3.61	4.85	6510	8261
4th Retransmission	6.86	10.19	13369	18448
5th Retransmission	13.03	21.39	26401	39841
6th Retransmission	24.76	44.93	51162	84766
7th Retransmission	47.05	94.34	98208	179109
8th Retransmission	89.39	198.12	187595	377229
9th Retransmission	169.84	330.00	357431	655350
10th Retransmission	270.00	330.00	627431	655350
11th Retransmission	270.00	330.00	655350	655350
12th Retransmission	270.00	330.00	655350	655350
13th Retransmission	270.00	330.00	655350	655350
14th Retransmission	270.00	330.00	655350	655350

Procedure:

Step	Action	Expected Behavior
1.	Upon reception of a DHCPv6 Solicit message TN1 transmits DHCPv6 Advertise message that contains a SOL_MAX_RT with a value of 300 seconds and no IA Options.	

2.	Observe any messages transmitted on Link A.	The NUT transmits properly formatted Solicit message according to the above chart.

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.

Reference:

- [8415] – Sections 16, 16.3, and 18.2.9

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

Step	Action	Expected Behavior
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.	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: No Client Identifier option

Step	Action	Expected Behavior
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.	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: Client Identifier that does not match the DUID of the client

Step	Action	Expected Behavior
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.	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: Transaction ID Mismatch

Step	Action	Expected Behavior
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.	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.

Reference:

- [8415] – Sections 16, and 16.10

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

Step	Action	Expected Behavior
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.	The NUT must silently discard the invalid Reply message. The NUT must continue to transmit its Request message.

Part B: No Client ID

Step	Action	Expected Behavior
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 does not contain a client ID option.	
6.	Observe the messages transmitted on Link A.	The NUT must silently discard the invalid Reply message. The NUT must continue to transmit its Request message.

Part C: Client ID Mismatch

Step	Action	Expected Behavior
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. The Reply message contains a client ID option with a	

	DUID that does not match the value the client used in its Request messages.	
9.	Observe the messages transmitted on Link A.	The NUT must silently discard the invalid Reply message. The NUT must continue to transmit its Request message.

Part D: Transaction ID Mismatch

Step	Action	Expected Behavior
10.	Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.	
11.	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.	
12.	Observe the messages transmitted on Link A.	The NUT must silently discard the invalid Reply message. The NUT must continue to transmit its Request message.

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.

Reference:

- [8415] – Sections 16.2, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9, 16.12, 16.13, and 16.14

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)

Step	Action	Expected Behavior
4.	The NUT should receive IPv6 address information from TN1.	
5.	TN1 transmits a Solicit message to the NUT port 546.	
6.	Observe the messages transmitted on Link A.	The NUT discards the Solicit message from TN1 and does not transmit any packets.

Part B: Request message (type 3)

Step	Action	Expected Behavior
7.	The NUT should receive IPv6 address information from TN1.	
8.	TN1 transmits a Request message to the NUT port 546.	
9.	Observe the messages transmitted on Link A.	The NUT discards the Request message from TN1 and does not transmit any packets.

Part C: Confirm message (type 4)

Step	Action	Expected Behavior
10.	The NUT should receive IPv6 address information from TN1.	
11.	TN1 transmits a Confirm message to the NUT port 546.	
12.	Observe the messages transmitted on Link A.	The NUT discards the Confirm message from TN1 and does not transmit any packets.

Part D: Renew message (type 5)

Step	Action	Expected Behavior
13.	The NUT should receive IPv6 address information from TN1.	
14.	TN1 transmits a Renew message to the NUT port 546.	
15.	Observe the messages transmitted on Link A.	The NUT discards the Renew message from TN1 and does not transmit any packets.

Part E: Rebind message (type 6)

Step	Action	Expected Behavior
16.	The NUT should receive IPv6 address information from TN1.	
17.	TN1 transmits a Rebind message to the NUT port 546.	
18.	Observe the messages transmitted on Link A.	The NUT discards the Rebind message from TN1 and does not transmit any packets.

Part F: Decline message (type 9)

Step	Action	Expected Behavior
19.	The NUT should receive IPv6 address information from TN1.	
20.	TN1 transmits a Decline message to the NUT port 546.	
21.	Observe the messages transmitted on Link A.	The NUT discards the Decline message from TN1 and does not transmit any packets.

Part G: Release message (type 8)

Step	Action	Expected Behavior
22.	The NUT should receive IPv6 address information from TN1.	
23.	TN1 transmits a Release message to the NUT port 546.	
24.	Observe the messages transmitted on Link A.	The NUT discards the Release message from TN1 and does not transmit any packets.

Part H: Relay-forward message (type 12)

Step	Action	Expected Behavior

25.	The NUT should receive IPv6 address information from TN1.	
26.	TN1 transmits a Relay-forward message to the NUT port 546.	
27.	Observe the messages transmitted on Link A.	The NUT discards the Relay-forward message from TN1 and does not transmit any packets.

Part I: Relay-reply message (type 13)

Step	Action	Expected Behavior
28.	The NUT should receive IPv6 address information from TN1.	
29.	TN1 transmits a Relay-reply message to the NUT port 546.	
30.	Observe the messages transmitted on Link A.	The NUT discards the Relay-reply message from TN1 and does not transmit any packets.

Part J: Information-request message (type 11)

Step	Action	Expected Behavior
31.	The NUT should receive IPv6 address information from TN1.	
32.	TN1 transmits a Information-request message to the NUT port 546.	
33.	Observe the messages transmitted on Link A.	The NUT discards the Information-request message from TN1 and does not transmit any packets.

Possible Problems:

- The DUT may send a Destination Unreachable messages in response to each message type intended for the server.

Test DHCP_Conf.1.3.7: 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.

Reference:

- [8415] – Sections 18.2.10, and 21.7
- [DHCP 3646] – Section 3 and 4

Test Setup: Connect the network as described in the Common Topology. If the NUT does not request an IA_NA option during its DHCPv6 exchange, TR1 sends a Router Advertisement containing the prefix for Link A to allow the NUT to use SLAAC to obtain a global address before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Using DNS Recursive Name Server option

Step	Action	Expected Behavior
1.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option 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.	The NUT transmitted a DNS Standard Query to TN3.

Part B: Using Domain Search List option

Step	Action	Expected Behavior
6.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option and a Domain Search List option 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.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.

Part C: DNS Recursive Name Server option updated by the server

Step	Action	Expected Behavior
11.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option 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.	The NUT transmitted a DNS Standard Query to TN3.
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.	The NUT transmitted a DNS Standard Query to TN4.

Part D: Domain Search List option updated by the server

Step	Action	Expected Behavior
20.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option and a Domain Search List option 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	

	TN3's Global address and a Domain Search List option including "TEST.EXAMPLE.COM".	
23.	NUT transmits an Echo Request to "DHCPv6".	
24.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.
25.	Wait T1 (50) seconds.	
26.	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.COM".	
27.	NUT transmits an Echo Request to "DHCPv6".	
28.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.COM" to TN3.

Part E: DNS Recursive Name Server option updated by the server

Step	Action	Expected Behavior
29.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option 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.	The NUT transmitted a DNS Standard Query to TN3.
34.	Wait T1 (80) seconds. TN1 does not respond to an Renew messages from the NUT.	
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.	The NUT transmitted a DNS Standard Query to TN4.

Part F: Domain Search List option updated by the server

Step	Action	Expected Behavior
38.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option and a Domain Search List option 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 a Domain Search List option including "TEST.EXAMPLE.COM".	
41.	NUT transmits an Echo Request to "DHCPv6".	
42.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.
43.	Wait T1 (80) seconds. TN1 does not respond to an Renew messages from the NUT.	
44.	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.COM".	
45.	NUT transmits an Echo Request to "DHCPv6".	
46.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.COM" to TN3.

Part G: DNS Recursive Name Server option omitted by the server

Step	Action	Expected Behavior
47.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option on the NUT (TN1 sets T1 to 50s and T2 to 80s).	
48.	Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.	
49.	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.	
50.	NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".	

51.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query to TN3.
52.	Wait T1 (50) seconds.	
53.	Upon the reception of a Renew message from the NUT, TN1 transmits a properly formatted Reply message with no DNS Recursive Name Server option.	
54.	NUT transmits an Echo Request to "DHCPv6.TEST.EXAMPLE.COM".	
55.	Observe the messages transmitted on Link A.	The NUT must NOT transmit a DNS Standard Query to TN3.

Part H: Domain Search List option omitted by the server

Step	Action	Expected Behavior
56.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option and a Domain Search List option on the NUT (TN1 sets T1 to 50s and T2 to 80s).	
57.	Upon the reception of a Solicit message from the NUT, TN1 transmits a properly formatted Advertise message.	
58.	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".	
59.	NUT transmits an Echo Request to "DHCPv6".	
60.	Observe the messages transmitted on Link A.	The NUT transmitted a DNS Standard Query whose QNAME is "DHCPv6.TEST.EXAMPLE.COM" to TN3.
61.	Wait T1 (50) seconds.	
62.	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 no Domain Search List option.	
63.	NUT transmits an Echo Request to "DHCPv6".	
64.	Observe the messages transmitted on Link A.	The NUTmust NOT transmit a DNS Standard Query whose QNAME is "DHCPv6.TEST.COM" to TN3.

Possible Problems:

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

Test DHCP_Conf.1.3.8: T1/T2 Time of Zero

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

Reference:

- [8415] – Sections 14.2 and 18.2.10

Test Setup: Connect the network as described in 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: T1 of Zero

Step	Action	Expected Behavior
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 contains an IA option with T1 set to 0 and T2 set to 80s.	
3.	Observe the messages transmitted on Link A.	The NUT must NOT transmit a DHCPv6 Renew message immediately.

Part B: T2 of Zero

Step	Action	Expected Behavior
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 that contains an IA option with T1 set to 50s and T2 set to 0.	
6.	Wait 50 seconds.	
7.	Observe the messages transmitted on Link A.	After the NUT transmits a DHCPv6 Renew message, it must NOT immediately transmit a DHCPv6 Rebind message.

Possible Problems:

- None.

Test DHCP_Conf.1.3.9: Unknown Types

Purpose: To verify that a client properly processes DHCPv6 messages that contain unknown option and message types.

Reference:

- [8415] – Section 16

Test Setup: Connect the network as described in 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: Unknown Option Type

Step	Action	Expected Behavior
1.	Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message. The Advertise message contains an option with an unknown option type.	
2.	Observe the messages transmitted on Link A.	The NUT must transmit a Request message, indicating that it processed the Advertise with an unkown option.

Part B: Unknown Message Type

Step	Action	Expected Behavior
3.	Upon the reception of a Solicit message from the NUT, TN1 transmits a message that includes an unknown message type.	
4.	Observe the messages transmitted on Link A.	The NUT must retransmit the Solicit, indicating that it did NOT process the unknown message.

Possible Problems:

- None.

Section 2: DHCPv6 Client – IA_NA

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 8415.
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 test cases in this section pertain to the functionality of DHCPv6 in regards to Address Assignment. Each test must be run with the client configured to request an IA_NA.

Overview

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

Group 1: Client Basic Behaviors, Constants and Format

Test DHCP_Conf.2.1.1: Basic Message Exchange – IA_NA

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

Reference:

- [8415] – Section 18

Test Setup: Connect the devices according to the Client 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.

Step	Action	Expected Behavior
1.	Common Test Setup 1.2 is performed.	
2.	Observe the messages transmitted on link A.	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.
3.	TN1 transmits an Echo Request to the NUT's Global Address.	
4.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.

Part B: Valid Reply message in response to Confirm message

Step	Action	Expected Behavior
5.	Common Test Setup 1.2 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.	Allow time for the NUT to perform Duplicate Address Detection (DAD).	
11.	TN1 transmit an Echo Request to the NUT's Global Address.	
12.	Observe the messages transmitted on Link A.	The NUT transmitted an Echo Reply in response to the Echo Request from TN1.

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

Step	Action	Expected Behavior
13.	Common Test Setup 1.2 is performed.	
14.	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).	
15.	Upon reception of a Renew message from the NUT at time T1, TN1 transmits a properly formatted Reply message.	
16.	TN1 transmits an Echo Request to NUT's Global Address.	
17.	Observe the messages transmitted on Link A.	The NUT transmitted an Echo Reply in response to the Echo Request from TN1.

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

Step	Action	Expected Behavior
18.	Common Test Setup 1.2 is performed.	
19.	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).	
20.	Upon reception of a Rebind message from the NUT at time T2, TN1 transmits a properly formatted Reply message.	
21.	TN1 transmits an Echo Request to NUT's Global Address.	
22.	Observe the messages transmitted on Link A.	The NUT transmitted an Echo Reply in response to the Echo Request from TN1.

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

Step	Action	Expected Behavior
23.	Common Test Setup 1.2 is performed.	
24.	The NUT should have received IPv6 address information from TN1.	
25.	Configure the client to release the IPv6 address.	

26.	Upon reception of the NUT's Release message, TN1 transmits a properly formatted Reply message to the NUT.	
27.	From TN1, transmit an ICMPv6 Echo Request to the NUT for the released address.	
28.	Observe the messages transmitted on Link A.	Upon reception of the Echo Request message from TN1 to the released address, the NUT did not send an Echo Reply message.

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

Step	Action	Expected Behavior
29.	Common Test Setup 1.2 is performed.	
30.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
31.	Upon reception of the NUT's Decline message, TN1 transmits a properly formatted Reply message to the NUT.	
32.	TN1 transmits an ICMPv6 Echo Request to the NUT for the configured address. Observe the messages transmitted on Link A.	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.2.1.2: IA_NA Option Format

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

Reference:

- [8415] – Section 18.1.1 and 21.4

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT	
2.	Observe the messages transmitted on link A.	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 number • Time T1 set to a number • Time T2 set to a number

Possible Problems:

- None.

Test DHCP_Conf.2.1.3: Identity Association Consistency

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

Reference:

- [8415] – Section 12.1

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT	
2.	Observe the messages transmitted on link A.	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 number
3.	Disable the NUT.	
4.	Enable DHCPv6 on the NUT.	
5.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing the same IAID value as Step 2.

Possible Problems:

- None.

Test DHCP_Conf.2.1.4: IA Address Option Format

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

Reference:

- [8415] – Section 18.2.4, and 21.6

Test Setup: Connect the devices according to the Client Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Step	Action	Expected Behavior
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.	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.2.1.5: Elapsed Time Option Format for IA_NAs

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

Reference:

- [8415] – Sections 21.9, 7.6, and 15

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 Confirm message

Step	Action	Expected Behavior
1.	Common Test Setup 1.2 is performed, and The NUT should have received IPv6 address information from TN1.	
2.	Configure NUT to transmit a Confirm message.	
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 message transmitted on Link A.	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 B: Elapsed Time Option in Decline message

Step	Action	Expected Behavior
5.	Common Test Setup 1.2 is performed, and The NUT should have received IPv6 address information from TN1.	
6.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
7.	Observe the message transmitted on Link A.	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

Possible Problems:

- None.

Test DHCP_Conf.2.1.6: 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.

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.3, and 21.9

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Retransmission Times:

Confirm Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmition	0.90	1.10	900	1100
2nd Retransmition	1.71	2.31	2610	3410
3rd Retransmition	3.25	4.40	5859	7810
4th Retransmition	3.60	4.40	9459	12210
5th Retransmition	3.60	4.40	13059	16610

Procedure:

Part A: Confirm message format

Step	Action	Expected Behavior
1.	The NUT should have received IPv6 address information from TN1.	
2.	Configure NUT to transmit a Confirm message.	
3.	Observe the messages transmitted on Link A.	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: Retransmission of Confirm messages

Step	Action	Expected Behavior
4.	The NUT should have received IPv6 address information from TN1.	
5.	Configure NUT to transmit a Confirm message.	
6.	Observe the messages transmitted on Link A until second Confirm message is received.	The NUT transmits a properly formatted Confirm message according to the 1st retransmitted message in the above chart.

Part C: Maximum Retransmission Time of Confirm messages

Step	Action	Expected Behavior
7.	The NUT should have received IPv6 address information from TN1.	
8.	Configure NUT to transmit a Confirm message.	
9.	Continue to capture Confirm messages until RT=MRT + MRT*RAND (3.6 <= RTprev <=4.4).	
10.	Observe the messages transmitted on Link A.	The NUT should properly transmit Confirm messages according to the above chart. The transaction ID is the same for all retransmitted messages. After CNF_MAX_RD (10 seconds), Cofirm messages are not observed. The elapsed-time value of the Confirm messages should be in the range of the above chart.

Part D: Maximum Retransmission Duration of Confirm messages

Step	Action	Expected Behavior
11.	The NUT should have received IPv6 address information from TN1.	
12.	Configure NUT to transmit a Confirm message.	
13.	Observe messages transmitted on Link A for 15 seconds.	The NUT must terminate the message transmission of Confirm messages after CNF_MAX_RD (10 seconds). The NUT must not transmit any more Confirm messages.

Part E: Reserved Address Information

Step	Action	Expected Behavior
14.	The NUT should have received IPv6 address information from TN1.	
15.	Configure NUT to transmit a Confirm message.	
16.	After reception of the first Confirm message, allow time for the NUT to perform Duplicate Address Detection (DAD). TN1 transmits an Echo Request to the NUT's Global Address obtained in Step 14 after CNF_MAX_RD (10 seconds) has elapsed.	
17.	Observe messages transmitted on Link A.	The NUT SHOULD continue using its IP address and transmit an Echo Reply to TN1.

Possible Problems:

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Part B, C, D.

Test DHCP_Conf.2.1.7: Transmission of Decline messages

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

Reference:

- [8415] – Sections 7.6, 15, 16.1, 18.2.8, and 21.9

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Retransmission Times:

Decline Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	-	-	0	0
1st Retransmition	0.9	1.1	900	1100
2nd Retransmition	1.71	2.31	2610	3410
3rd Retransmition	3.25	4.85	5859	8261
4th Retransmition	6.17	10.19	12032	18448
5th Retransmition	11.73	21.39	23761	39841

Procedure:

Part A: Decline message format

Step	Action	Expected Behavior
1.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Decline message to TN1 containing: • A source address, not equal to 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: Decline of received address

Step	Action	Expected Behavior
3.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
4.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Decline message to TN1.
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.	The NUT must not reply to the ICMPv6 Echo Request transmitted from TN1.

Part C: Retransmission of Decline message

Step	Action	Expected Behavior
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 is received.	The NUT transmits a properly formatted Decline Message according to the 1st retransmitted message in the above chart.

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

Step	Action	Expected Behavior
9.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
10.	Observe messages transmitted on Link A.	The NUT must terminate the message exchange after the transmission of DEC_MAX_RC (5) Decline messages. Then 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 above chart.

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

Step	Action	Expected Behavior
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 messages transmitted on Link A.	The NUT ceases the transmission of Decline messages upon reception of the Reply message from TN1.

Possible Problems:

- If DEC_MAX_RC means the max Retransmission count in RFC 8415, the expected behavor of Part D in Step 10 can be: The NUT must terminate the message exchange after the transmission of one Decline message and retransmission of DEC_MAX_RC (5) Decline messages. The NUT must not transmit any more Decline messages.
- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts C and D.

Test DHCP_Conf.2.1.8: Transmission of Release messages – Release of IA_NA

Purpose: To verify that a client device properly releases Ipv6 addresses configured by a server.

Reference:

- [8415] – Section 18.2.7

Test Setup: Connect the devices according to the Client Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 on the NUT is disabled after each part.

Procedure:

Step	Action	Expected Behavior
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.	NUT transmits a properly formatted Release message to TN1.
4.	TN1 transmits an ICMPv6 Echo Request to the NUT for the released address.	
5.	Observe the messages transmitted on Link A.	The NUT must not reply to the Echo Request.

Possible Problems:

- None.

Test DHCP_Conf.2.1.9: Reception of Reply messages

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

Reference:

- [8415] – Sections 18.2.10

Test Setup: Connect the network as described in 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: T1 and T2 Times Recorded

Step	Action	Expected Behavior
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.	The NUT transmitted a Renew message to TN1.
5.	Wait 30(T2-T1) seconds.	
6.	Observe the messages transmitted on Link A.	The NUT transmitted a Rebind message to TN1.

Part B: New Address in IA option

Step	Action	Expected Behavior
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.	The NUT must transmit an Echo Reply to TN1 using Address1.
12.	TN1 transmits an Echo Request to the NUT's Address2.	
13.	Observe the messages transmitted on Link A.	The NUT must transmit an Echo Reply to TN1 using Address2.

Part C: Update Lifetimes

Step	Action	Expected Behavior
14.	Common Test Setup 1.2 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.	The NUT must transmit an Echo Reply to TN1.
19.	Wait 110 seconds.	
20.	TN1 transmits an Echo Request to NUT's Global Address.	
21.	Observe the messages transmitted on Link A.	The NUT must NOT transmit an Echo Reply to TN1.

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

Step	Action	Expected Behavior
22.	Common Test Setup 1.2 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.	The NUT must NOT transmit an Echo Reply to TN1.

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

Step	Action	Expected Behavior
27.	Common Test Setup 1.2 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.	Observe the messages transmitted on Link A.	The NUT must transmit a Renew message to TN1.
31.	TN1 transmits an Echo Request to NUT's original Global Address before the valid lifetime expires.	
32.	Observe the messages transmitted on Link A.	The NUT must transmit an Echo Reply to TN1.

Possible Problems:

- None.

Test DHCP_Conf.2.1.10: Reception of Reply messages after a Confirm message

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

Reference:

- [8415] – Sections 18.2.10.3

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

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

Step	Action	Expected Behavior
1.	The NUT should have received IPv6 address information from TN1	
2.	Configure NUT to transmit a Confirm message.	
3.	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.	
4.	Observe the messages transmitted on Link A.	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 B: Reply message in response to a Confirm message.

Step	Action	Expected Behavior
5.	The NUT should have received IPv6 address information from TN1	
6.	Configure NUT to transmit a Confirm message.	
7.	Upon reception of a Confirm message from the NUT, TN1 transmits a properly formatted Reply message.	
8.	TN1 transmits an Echo Request to the NUT's Global Address.	The NUT transmits an Echo Reply to TN1.

Possible Problems:

- None.

Test DHCP_Conf.2.1.11: Reception of Reply messages after a Release message

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

Reference:

- [8415] – Sections 18.2.10.2

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	The NUT should have received IPv6 address information from TN1.	
2.	Configure the client to release the IPv6 address.	
3.	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.	
4.	Observe the messages transmitted on Link A.	Upon reception of the Reply message from TN1, the NUT did not send any additional Release messages.
5.	From TN1, transmit an ICMPv6 Echo Request to the NUT for the released address.	
6.	Observe the messages transmitted on Link A.	Upon reception of the Echo Request message from TN1 to the released address, the NUT did not send an Echo Reply message.

Possible Problems:

- None.

Test DHCP_Conf.2.1.12: Reception of Reply messages after a Decline message

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

Reference:

- [8415] – Sections 18.2.10.2

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
2.	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.	
3.	Observe the messages transmitted on Link A.	Upon reception of the Reply message from TN1, the NUT did not send any additional Decline messages.
4.	From TN1, transmit an ICMPv6 Echo Request to the NUT for the configured address.	
5.	Observe the messages transmitted on Link A.	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.2.1.13: Reception of Invalid Reply message – IA_NA Option

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

Reference:

- [8415] – Sections 21.4, and 21.6

Test Setup: Connect the network as described in 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: Contains invalid IA_NA option T1 > T2

Step	Action	Expected Behavior
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 contains an IA_NA option with T1 greater than T2.	
3.	TN1 transmits an Echo Request to the NUT's Global Address.	
4.	Observe the messages transmitted on Link A.	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 B: Contains invalid IA Address (preferred lifetime > valid lifetime)

Step	Action	Expected Behavior
5.	Upon the reception of a Solicit message from the NUT, TN1 transmits a valid Advertise message.	
6.	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.	
7.	TN1 transmits an Echo Request to the NUT's Global Address.	
8.	Observe the messages transmitted on Link A.	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.2.1.14: Address Change

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

Reference:

- [8415] – Section 18.2.10

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	TN1 transmits an Echo Request to the NUT's Global Address.	
2.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.
3.	Upon reception of the NUT's Renew message, TN1 transmits a properly formatted Reply message with IA_NA option including two IA address options (Address1 and Address2). Address1's valid lifetime is set to 0.	
4.	TN1 transmits an Echo Request to the NUT's Global Address.	The NUT must NOT transmit an Echo Reply to TN1.
5.	TN1 transmits an Echo Request to the NUT's new address, Address2.	The NUT should transmit an Echo Reply to TN1.

Possible Problems:

- None.

Test DHCP_Conf.2.1.15: On-link Addresses

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

Reference:

- [8415] – Sections 18.2.10.1

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.2 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Prefix onlink

Step	Action	Expected Behavior
1.	TR1 sends an RA that includes the prefix that matches the Address assigned through DHCPv6. The onlink flag (L flag) is set to 1.	
2.	TN1 transmits an Echo Request to the NUT's Global Address. The Echo Request has a source address that matches the prefix from step 1.	The NUT should transmit an Echo Reply directly to TN1.

Part A: Prefix not onlink

Step	Action	Expected Behavior
3.	TR1 sends an RA that includes the prefix that matches the Address assigned through DHCPv6. The onlink flag (L flag) is set to 0.	
4.	TN1 transmits an Echo Request to the NUT's Global Address. The Echo Request has a source address that matches the prefix from step 1.	The NUT should transmit an Echo Reply with a first hop to TR1.

Possible Problems:

- None.

Section 3: DHCPv6 Client – IA_PD

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 8415.
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 test cases in this section pertain to the functionality of DHCPv6 in regards to Prefix Delegation. Each test must be run with the client configured to request an IA_PD.

Overview

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

Test DHCP_Conf.3.1.1: Prefix Options Format

Purpose: To verify that the requesting router transmits the correct prefix options format.

Reference:

- [8415] – Sections 12.2, 21.21, and 21.22

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

Procedure:

Part A: IA_PD Option Format

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	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: IA_PD Prefix Option Format

Step	Action	Expected Behavior
3.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
4.	Wait T1 (50) seconds.	
5.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Renew 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 C: IAID Consistency

Step	Action	Expected Behavior
6.	Enable DHCPv6 on the NUT.	
7.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message.
8.	Reboot the NUT .	
9.	Enable DHCPv6 on the NUT.	
10.	Observe the messages transmitted on Link A.	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.3.1.2: Basic Message Exchange – IA_PD

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

Reference:

- [8415] – Section 18

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

Procedure:

Part A: Valid Reply message in response to Request.

Step	Action	Expected Behavior
1.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
2.	Wait 50 seconds.	
3.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.

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

Step	Action	Expected Behavior
4.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
5.	Wait 50 seconds.	
6.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.
7.	Upon reception of a Renew message from the NUT at time T1, TN1 transmits a properly formatted Reply message.	
8.	Wait 50 seconds.	
9.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.

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

Step	Action	Expected Behavior
10.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
11.	Wait 80 seconds. TN1 does not respond to any Renew messages from the NUT.	
12.	Observe the messages transmitted on Link A.	The NUT should send a valid Rebind Message containing the prefix assigned to it.

13.	Upon reception of a Rebind message from the NUT at time T2, TN1 transmits a properly formatted Reply message.	
14.	Wait 50 seconds.	
15.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.

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

Step	Action	Expected Behavior
16.	Common Test Setup 1.3 is performed.	
17.	Configure NUT to release the IPv6 prefix.	
18.	Observe the messages transmitted on Link A.	The NUT should send a valid Release Message containing the prefix assigned to it.
19.	Upon reception of a Release message from the NUT, TN1 transmits a properly formatted Reply message.	
20.	Wait 50 seconds.	
21.	Observe the messages transmitted on Link A.	The NUT should not send a Renew Message containing the prefix assigned to it.

Possible Problems:

- None.

Test DHCP_Conf.3.1.3: 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.

Reference:

- [8415] – Section 18.2.10, 21.21, 21.22

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

Procedure:

Part A: T1 and T2 Times Recorded

Step	Action	Expected Behavior
1.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
2.	Wait 50 seconds.	
3.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.
4.	Wait 30 seconds	
5.	Observe the messages transmitted on Link A.	The NUT should send a valid Rebind Message containing the prefix assigned to it.

Part B: T1 and T2 Times Updated

Step	Action	Expected Behavior
6.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
7.	Wait 50 seconds. Upon reception of the Renew from the NUT, TN1 transmits a properly formatted Reply message with a IA_PD option (T1=60s T2=90s)	
8.	Wait 60 seconds.	
9.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing the prefix assigned to it.
10.	Wait 30 seconds.	
11.	Observe the messages transmitted on Link A.	The NUT should send a valid Rebind Message containing the prefix assigned to it.

Part C: New Prefix in IA option

Step	Action	Expected Behavior
12.	Upon reception of the Solicit from the NUT, TR1 transmits a properly formatted Advertise message.	

13.	Upon reception of the Request from the NUT, TN1 transmits a properly formatted Reply message with an IA_PD option (T1=50s with one Prefix option Prefix1).	
14.	Wait 50 seconds. Upon reception of the Renew from the NUT, TN1 transmits a properly formatted Reply message with an IA_PD option including two Prefix options (Prefix1 and Prefix2).	
15.	Wait 50 seconds.	
16.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message containing Prefix1.

Part D: Update Lifetimes

Step	Action	Expected Behavior
17.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
18.	Wait 50 seconds. Upon reception of the Renew from the NUT, TN1 transmits a properly formatted Reply message with an IA_PD option. The prefix included has a valid lifetime set to 100s.	
19.	Wait 100 seconds.	
20.	Observe the messages transmitted on Link A.	The NUT must transmit a Solicit message.

Part E: IA Prefix option – Valid Lifetime set to zero

Step	Action	Expected Behavior
21.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
22.	Wait 50 seconds. Upon reception of the Renew from the NUT, TN1 transmits a properly formatted Reply message with an IA_PD option. The prefix included has a valid lifetime set to 0s.	
23.	Observe the messages transmitted on Link A.	The NUT must not transmit a Renew message containing the prefix.

Part F: IA Prefix option not included in IA from Server

Step	Action	Expected Behavior
24.	Common Test Setup 1.3 is performed. T1 and T2 are set to 50s and 80s.	
25.	Upon reception of the Renew from the NUT, TN1 transmits a properly formatted Reply message with an IA_PD option without an IA prefix option.	

26.	Observe the messages transmitted on Link A.	The NUT should send a valid Renew Message.

Possible Problems:

- None.

Test DHCP_Conf.3.1.4: 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.

Reference:

- [8415] – Section 21.21, 21.22

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

Procedure:

Part A: Reply Message contains IA_PD option with T1>T2

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Upon reception of the Solicit from the NUT, TN1 transmits a properly formatted Advertise message.	
3.	Upon reception of the Request from the NUT, TN1 transmits a properly formatted Reply message containing an IA_PD option with T1 greater than T2.	
4.	After 50 seconds, observe the messages transmitted on Link A.	The NUT must NOT transmit any Renew message to TN1 containing the prefix from step 3.

Part B: Reply Message contains invalid Prefix (preferred lifetime > valid lifetime)

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Upon reception of the Solicit from the NUT, TN1 transmits a properly formatted Advertise message.	
7.	Upon reception of the Request from the NUT, TN1 transmits a properly formatted Reply message containing IA_PD (T1=50s, T2=80s, Prefix1 and Prefix2 are in separate IA_PD Prefix Option), and Prefix2 with preferred lifetime > valid lifetime.	
8.	After 50 seconds, observe the messages transmitted on Link A.	The NUT must transmit a Renew message with only the Prefix1, and Prefix2 must not appear in the IA_PD option of the Renew message.

Possible Problems:

- None.

Test DHCP_Conf.3.1.5: Prefix Change

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

Reference:

- [8415] – Sections 18.2.10

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.3 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	Wait 50 seconds.	
2.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing the IA_PD Prefix assigned in Common Test Setup, Prefix1.
3.	Upon reception of the NUT's Renew message, TN1 transmits a properly formatted Reply message with IA_PD option including two IA prefix options (Prefix1 and Prefix2). Prefix1's valid lifetime is set to 0.	
4.	Wait 50 seconds.	
5.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing Prefix2 and NOT Prefix1 from step 2.

Possible Problems:

- None.

Test DHCP_Conf.3.1.6: Refreshing Configuration Information

Purpose: To verify a client device transmits properly formatted Rebind messages and properly implements the mechanism for message exchange termination for Rebind messages after it has detected a network change.

Reference:

- [8415] – Sections 7.6, 15, and 18.2.12

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.3 is performed before each part. DHCPv6 is disabled on the client device after each part.

Retransmission Times:

Rebind Message, following retransmission values for Confirm	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmition	0.90	1.10	900	1100
2nd Retransmition	1.71	2.31	2610	3410
3rd Retransmition	3.25	4.40	5859	7810
4th Retransmition	3.60	4.40	9459	12210
5th Retransmition	3.60	4.40	13059	16610

Note, in accordance with RFC 8415, section 18.2.12, these values are set as for the Confirm Message.

Procedure:

Part A: Rebind after Reboot

Step	Action	Expected Behavior
1.	Wait 50 seconds.	
2.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix.
3.	TN1 transmits a Reply message.	
4.	Reboot the NUT.	
5.	Observe the messages transmitted on Link A.	The NUT should transmit a Rebind message containing its IA_PD prefix.
6.	TN1 transmits a Reply message.	
7.	Wait 50 seconds.	
8.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix.

Part B: Rebind after Reconnect

Step	Action	Expected Behavior
9.	Wait 50 seconds.	
10.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix.
11.	TN1 transmits a Reply message.	
12.	Disconnect the NUT from Net1. Wait for the NUT to register link-down, then reconnect the NUT.	
13.	Observe the messages transmitted on Link A.	The NUT should transmit a Rebind message containing its IA_PD prefix.
14.	TN1 transmits a Reply message.	
15.	Wait 50 seconds.	
16.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix.

Part C: Maximum Retransmission Time of Rebind messages

Step	Action	Expected Behavior
17.	Disconnect the NUT from Net1. Wait for the NUT to register link-down, then reconnect the NUT.	The NUT should transmit a Rebind message containing its IA_PD prefix.
18.	Continue to capture Rebind messages until RT=MRT + MRT*RAND (3.6 <= RTprev <=4.4).	
19.	Observe the messages transmitted on Link A.	The NUT should properly transmit Rebind messages according to the above chart. The transaction ID is the same for all retransmitted messages. After CNF_MAX_RD (10 seconds), Rebind messages are not observed. The elapsed-time value of the Rebind messages should be in the range of the above chart.

Part D: Maximum Retransmission Duration of Rebind messages

Step	Action	Expected Behavior
20.	Disconnect the NUT from Net1. Wait for the NUT to register link-down, then reconnect the NUT.	
21.	Observe messages transmitted on Link A for 15 seconds.	The NUT must terminate the message transmission of Rebind messages after CNF_MAX_RD (10 seconds). The NUT must not transmit any more Rebind messages.

Possible Problems:

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts C & D.
- The NUT may not support having a stable DHCP state across reboots and may send a DHCPv6 Solicit in Part A, Step 5. If this is the case, Part A may be omitted.

Section 4: DHCPv6 Client - IA_NA and IA_PD

Scope

The following tests cover specifications for the client implementation of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6), Request For Comments 8415.
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 test cases in this section pertain to the functionality of DHCPv6 in regards to Address Acquisition and Prefix Delegation. Each test must be run with the client configured to request an IA_NA and an IA_PD.

Overview

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

Test DHCP_Conf.4.1.1: Single Exchange for Multiple IAs

Purpose: To verify that a client properly performs a single exchange with a server.

Reference:

- [8415] – Sections 18.1 and 18.2.4

Test Setup: Connect the network as described in 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: Higher IA_NA T1

Step	Action	Expected Behavior
1.	Configure the NUT to request both an IA_NA and IA_PD Option.	
2.	Upon the reception of the Solicit message, TN1 transmits a valid Advertise message.	
3.	Upon the reception of the Request message, TN1 transmits an Reply message that contains an IA_NA Option with T1 set to 70 seconds and an IA_PD Option with T1 set to 50 seconds. Both IAs should include T2 of 80 seconds.	
4.	Wait 50 seconds.	The NUT should transmit a DHCPv6 Renew message containing both IA_NA and IA_PD options at 50 seconds.

Part B: Higher IA_NA T2

Step	Action	Expected Behavior
5.	Configure the NUT to request both an IA_NA and IA_PD Option.	
6.	Upon the reception of the Solicit message, TN1 transmits a valid Advertise message.	
7.	Upon the reception of the Request message, TN1 transmits an Reply message that contains an IA_NA Option with T2 set to 100 seconds and an IA_PD Option with T2 set to 80 seconds. Both IAs should include T1 of 50 seconds.	
8.	Wait 80 seconds.	The NUT should transmit a DHCPv6 Renew message containing both IA_NA and IA_PD options at 80 seconds.

Part C: Higher IA_PD T1

Step	Action	Expected Behavior
9.	Configure the NUT to request both an IA_NA and IA_PD Option.	
10.	Upon the reception of the Solicit message, TN1 transmits a valid Advertise message.	
11.	Upon the reception of the Request message, TN1 transmits an Reply message that contains an IA_NA Option with T1 set to 50 seconds and an IA_PD Option with T1 set to 70 seconds. Both IAs should include T2 of 80 seconds.	
12.	Wait 50 seconds.	The NUT should transmit a DHCPv6 Renew message containing both IA_NA and IA_PD options at 50 seconds.

Part D: Higher IA_PD T2

Step	Action	Expected Behavior
13.	Configure the NUT to request both an IA_NA and IA_PD Option.	
14.	Upon the reception of the Solicit message, TN1 transmits a valid Advertise message.	
15.	Upon the reception of the Request message, TN1 transmits an Reply message that contains an IA_NA Option with T2 set to 80 seconds and an IA_PD Option with T2 set to 100 seconds. Both IAs should include T1 of 50 seconds.	
16.	Wait 80 seconds.	The NUT should transmit a DHCPv6 Renew message containing both IA_NA and IA_PD options at 80 seconds.

Possible Problems:

- None.

Test DHCP_Conf.4.1.2: No IA_PD Option in Decline Message

Purpose: To verify that a client does not include an IA_PD Option in a Decline message.
Reference:

- [8415] – Sections 18.2.8

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.4 is performed. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	After receiving a DAD NS from the NUT, TN1 transmits a solicited NA for that tentative address.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a Decline message that does NOT contain an IA_PD Option to TN1.

Possible Problems:

- None.

Test DHCP_Conf.4.1.3: Refreshing Configuration Information – IA_PD and IA_NA

Purpose: To verify that a client properly performs a single exchange with a server after it has detected a network change.

Reference:

- [8415] – Section 18.2.12

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.4 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Rebind after Reboot

Step	Action	Expected Behavior
1.	TN1 transmits an Echo Request to the NUT's Global Address.	
2.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.
3.	Wait 50 seconds after DHCPv6 Reply message.	
4.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix and IA_NA address.
5.	TN1 transmits a Reply message.	
6.	Reboot the NUT.	
7.	Observe the messages transmitted on Link A.	The NUT should transmit a Rebind message. The Rebind must contain an IA_PD option and an IA_NA option.
8.	TN1 transmits a Reply message.	
9.	TN1 transmits an Echo Request to the NUT's Global Address.	
10.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.
11.	Wait 50 seconds after DHCPv6 Reply message.	
12.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix and IA_NA address.

Part B: Rebind after Reconnect

Step	Action	Expected Behavior
13.	TN1 transmits an Echo Request to the NUT's Global Address.	
14.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.
15.	Wait 50 seconds after DHCPv6 Reply message.	

16.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix and IA_NA address.
17.	TN1 transmits a Reply message.	
18.	Disconnect the NUT from Net1. Wait for the NUT to register link-down, then reconnect the NUT.	
19.	Observe the messages transmitted on Link A.	The NUT should transmit a Rebind message. The Rebind must contain an IA_PD option and an IA_NA option.
20.	TN1 transmits a Reply message.	
21.	TN1 transmits an Echo Request to the NUT's Global Address.	
22.	Observe the messages transmitted on Link A.	The NUT should transmit an Echo Reply to TN1.
23.	Wait 50 seconds after DHCPv6 Reply message.	
24.	Observe the messages transmitted on Link A.	The NUT should transmit a Renew message containing its IA_PD prefix and IA_NA address.

Possible Problems:

- The NUT may not support having a stable DHCP state across reboots and may send a DHCPv6 Solicit in Part A, Step 5. If this is the case, Part A may be omitted.

Section 5: Stateless DHCPv6 Client

Scope

The following tests cover specifications for the client implementation of the Stateless Operation Model for Dynamic Host Configuration Protocol for IPv6 (DHCPv6), as described in section 6.1 of Request For Comments 8415. 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.5.1.1: Basic Message Exchanges

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

Reference:

- [8415] – Sections 6.1, 18.2.10, and 18.2.10.4
- [3646] – Section 3

Test Setup: Connect the network as described in the Common Topology. TR1 transmits an RA containing the prefix for Link A at the beginning of each part. A static global address may be configured on the NUT if it does not support SLAAC. DHCPv6 is disabled on the client device after each part.

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT must transmit an Information-request message.
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.	The NUT must process the correct Reply message and transmit a DNS Standard Query to TN3.

Possible Problems:

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

Test DHCP_Conf.5.1.2: Basic Message Exchange

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

Reference:

- [8415] – Section 6.1, 7.1, 7.2, and 14
- [3646] – Section 3
- [4443] – Section 3.1

Test Setup: Connect the network as described in the Common Topology. TR1 transmits an RA containing the prefix for Link A at the beginning of each part. A static global address may be configured on the NUT if it does not support SLAAC. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Multicast Addresses

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	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: Valid UDP port

Step	Action	Expected Behavior
3.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option on the NUT.	
4.	Observe the messages transmitted on Link A.	The NUT must transmit an Information-request message with a destination UDP port set to 547.
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.	The NUT must process the correct Reply message and transmit a DNS Standard Query to TN3.

Part C: Invalid UDP port

Step	Action	Expected Behavior
8.	Enable DHCPv6 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.	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:

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

Test DHCP_Conf.5.1.3: Client Message Format

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

Reference:

- [8415] – Section 7.3, 8, and 16.1

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Information-request message containing the following elements: • 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.5.1.4: Elapsed Time Option Format

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

Reference:

- [8415] – Sections 18.2.6, and 21.9

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

Procedure:

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the first Information-Request message transmitted on Link A.	The NUT transmits properly formatted Information-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

Possible Problems:

- None.

Test DHCP_Conf.5.1.5: Option Request Option Format

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

Reference:

- [8415] – Section 18.2.6, 21.23, 21.25
- [3646] – Section 3, and 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: DNS Recursive Name Server option

Step	Action	Expected Behavior
1.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option on the NUT.	
2.	Observe the messages transmitted on Link A.	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: Domain Search List option

Step	Action	Expected Behavior
3.	Enable DHCPv6 which is configured to request a Domain Search List option on the NUT.	
4.	Observe the messages transmitted on Link A.	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)

Part C: Information Request Time Option

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Observe the messages transmitted on Link A.	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 INFORMATION_REFRESH_TIME option (32)

Part D: INF_MAX_RT Option

Step	Action	Expected Behavior
7.	Enable DHCPv6 on the NUT.	
8.	Observe the messages transmitted on Link A.	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 INF_MAX_RT option (83)

Part E: Option codes not included

Step	Action	Expected Behavior
9.	Enable DHCPv6 on the NUT.	
10.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Information-Request messages that does NOT contain the following Option Request Option values: • Client Identifier (1) • Server Identifier (2) • IA_NA (3) • IA_TA (4) • IA_PD (25) • IA Address (5) • IA Prefix (26)

		• Option Request (6) • Elapsed Time (8) • Preference (7) • Relay Message (9) • Authentication (11) • Server Unicast (12) • Status Code (13) • Rapid Commit (14) • User Class (15) • Vendor Class (16) • Interface-Id (18) • Reconfigure Message (19) • Reconfigure Accept (20)

Possible Problems:

- None.

Test DHCP_Conf.5.1.6: Transmission of Information-request message

Purpose: To verify a client device properly transmits Information-request messages.

Reference:

- [8415] – Section 7.6, 15, 18.2.6, and 21.9

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

Retransmission Times:

Information-Request Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmission	1.00	1.10	1000	1100
2nd Retransmission	1.90	2.31	2900	3410
3rd Retransmission	3.61	4.85	6510	8261
4th Retransmission	6.86	10.19	13369	18448
5th Retransmission	13.03	21.39	26401	39841
6th Retransmission	24.76	44.93	51162	84766
7th Retransmission	47.05	94.34	98208	179109
8th Retransmission	89.39	198.12	187595	377229
9th Retransmission	169.84	416.05	357431	793280
10th Retransmission	322.69	873.71	680118	1666988
11th Retransmission	613.11	1834.79	1293225	3501775
12th Retransmission	1164.90	3853.05	2458128	7354828
13th Retransmission	2213.31	3960.00	4671443	11314828
14th Retransmission	3240.00	3960.00	7911443	15274828

Procedure:

Part A: Reliability of DHCPv6 Retransmission

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Information-request message containing the following elements:

		• The msg-type field was set to the value of 11 (Information-request) • A header containing a Transaction ID • An Elapsed Time Option • An Option Request Option which requested-option-code-n set to INFORMATION_REFRESH_TIME option (32) and INF_MAX_RT option (83)
3.	Wait for second Information-request message.	
4.	Observe the messages transmitted on Link A.	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: Retransmission of Information-request message.

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Information-request message.
7.	Wait for second Information-request message.	
8.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Information-request message according to the 1st retransmitted message in the above chart.

Part C: Maximum Retransmission Time of Information-request message.

Step	Action	Expected Behavior
9.	Enable DHCPv6 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.	The NUT transmitted the first Information-request message containing an Elapsed Time option with its elapsed-time value set to 0. The NUT retransmitted the Information-request messages containing elapsed-time values set to the time elapsed since the first Information-request message was transmitted.

		When the elapsed time was greater than 0xffff the NUT transmitted Information-request messages containing elapsed-time values set to 0xffff. The elapsed-time value of the Information-request messages must be in the range of the chart above.

Possible Problems:

- The NUT may define other values for Transmission and Retransmission Parameters in RFC8415. These values can be used for Parts B and C.

Test DHCP_Conf.5.1.7: Reception of Reply messages for Information Refresh Time Option

Purpose: To verify a client device properly handles the reception of Reply messages for the Information Request Time option after initiating an exchange.

Reference:

- [8415] – Sections 7.6 and 21.23

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

Procedure:

Part A: Information Refresh Time Option set to 650

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a Information Request Time option with the information-request-time set to 650.	
3.	Wait 650 seconds for second Information-Request message.	
4.	Observe the messages transmitted on Link A.	The NUT transmitted an Information-Request message 650 seconds after receiving the Reply message.

Part B: No Information Refresh Time Option

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message that does not contain an Information Request Time option.	
7.	Wait 86400 seconds(24 hours) for second Information-Request message.	
8.	Observe the messages transmitted on Link A.	The NUT transmitted an Information-Request message 24 hours after receiving the Reply message.

Part C: Information Refresh Time Option less than IRT_MINIMUM

Step	Action	Expected Behavior
9.	Enable DHCPv6 on the NUT.	
10.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with a Information Request Time option with the information-request-time set to 50.	
11.	Wait 600 seconds for second Information-Request message.	
12.	Observe the messages transmitted on Link A.	The NUT transmitted an Information-Request message 600 seconds after receiving the Reply message.

Possible Problems:

- None.

Test DHCP_Conf.5.1.8: Reception of Reply messages for INF_MAX_RT Option

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

Reference:

- [8415] – Sections 7.6, 15, 18.2.6, and 21.25

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

Retransmission Times:

Information-Request Message	Minimum Delay (seconds)	Maximum Delay (seconds)	Minimum Elapsed Time	Maximum Elapsed Time
1st Message	0.00	0	0	0
1st Retransmission	1.00	1.10	1000	1100
2nd Retransmission	1.90	2.31	2900	3410
3rd Retransmission	3.61	4.85	6510	8261
4th Retransmission	6.86	10.19	13369	18448
5th Retransmission	13.03	21.39	26401	39841
6th Retransmission	24.76	44.93	51162	84766
7th Retransmission	47.05	94.34	98208	179109
8th Retransmission	89.39	198.12	187595	377229
9th Retransmission	169.84	330.00	357431	655350
10th Retransmission	270.00	330.00	627431	655350
11th Retransmission	270.00	330.00	655350	655350
12th Retransmission	270.00	330.00	655350	655350
13th Retransmission	270.00	330.00	655350	655350
14th Retransmission	270.00	330.00	655350	655350
15th Retransmission	270.00	330.00	655350	655350

Procedure:

Part A: INF_MAX_RT Option set to 300

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	

2.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with an INF_MAX_RT option with the INF_MAX_RT value set to 300, a Client ID Option, a Server ID Option, and Information Request Time option with the information-request-time set to 600.	
3.	Wait 600 seconds.	
4.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Information-request messages according to the above chart.

Part B: INF_MAX_RT Option less than 60

Step	Action	Expected Behavior
5.	Enable DHCPv6 on the NUT.	
6.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with an INF_MAX_RT option with the INF_MAX_RT value set to 45, a Client ID Option, a Server ID Option, and Information Request Time option with the information-request-time set to 600.	
7.	Wait 600 seconds.	
8.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Information-request messages according to the above chart.

Part C: INF_MAX_RT Option greater than 86400

Step	Action	Expected Behavior
9.	Enable DHCPv6 on the NUT.	
10.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message with an INF_MAX_RT option with the INF_MAX_RT value set to 87000, a Client ID Option, a Server ID Option, and Information Request Time option with the information-request-time set to 600.	

11.	Wait 600 seconds.	
12.	Observe the messages transmitted on Link A.	The NUT transmits properly formatted Information-request messages according to the above chart.

Possible Problems:

- None.

Test DHCP_Conf.5.1.9: 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.

Reference:

- [8415] – Section 18.2.10
- [3646] – Sections 3 and 4

Test Setup: Connect the network as described in the Common Topology. TR1 transmits an RA containing the prefix for Link A at the beginning of each part. A static global address may be configured on the NUT if it does not support SLAAC. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Using DNS Recursive Name Server option

Step	Action	Expected Behavior
1.	Enable DHCPv6 which is configured to request 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.	The NUT transmitted a DNS Standard Query to TN3.

Part B: Using Domain Search List option

Step	Action	Expected Behavior
5.	Enable DHCPv6 which is configured to request a DNS Recursive Name Server option 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.	The NUT transmitted a DNS Standard Query whose QNAME is “DHCPv6.TEST.EXAMPLE.COM” to TN3.

Possible Problems:

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

Test DHCP_Conf.5.1.10: Reception of Invalid Reply message

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

Reference:

- [8415] – Section 16.10

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

Procedure:

Part A: No Server Identifier option

Step	Action	Expected Behavior
1.	Upon the reception of an Information-request message, TN1 transmits a Reply message that does not contain a Server Identifier option.	
2.	Observe the messages transmitted on Link A.	The NUT must silently discard the invalid Reply message. The NUT continued to transmit its Information-request message.

Part B: Using Domain Search List option

Step	Action	Expected Behavior
3.	Upon the reception of an Information-request message, TN1 transmits a Reply. 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.	The NUT must silently discard the invalid Reply message. The NUT continued to transmit its Information-request message.

Possible Problems:

- None.

Test DHCP_Conf.5.1.11: 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.

Reference:

- [8415] – Sections 16.2, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9, 16.12, 16.13, and 16.14

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

Procedure:

Part A: Solicit message (type 1)

Step	Action	Expected Behavior
1.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
2.	TN1 transmits a Solicit message to the NUT port 546.	
3.	Observe the messages transmitted on Link A.	The NUT discards the Solicit message from TN1 and does not transmit any packets.

Part B: Request message (type 3)

Step	Action	Expected Behavior
4.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
5.	TN1 transmits a Request message to the NUT port 546.	
6.	Observe the messages transmitted on Link A.	The NUT discards the Request message from TN1 and does not transmit any packets.

Part C: Confirm message (type 4)

Step	Action	Expected Behavior
7.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
8.	TN1 transmits a Confirm message to the NUT port 546.	
9.	Observe the messages transmitted on Link A.	The NUT discards the Confirm message from TN1 and does not transmit any packets.

Part D: Renew message (type 5)

Step	Action	Expected Behavior
10.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
11.	TN1 transmits a Renew message to the NUT port 546.	
12.	Observe the messages transmitted on Link A.	The NUT discards the Renew message from TN1 and does not transmit any packets.

Part E: Rebind message (type 6)

Step	Action	Expected Behavior
13.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
14.	TN1 transmits a Rebind message to the NUT port 546.	
15.	Observe the messages transmitted on Link A.	The NUT discards the Rebind message from TN1 and does not transmit any packets.

Part F: Decline message (type 9)

Step	Action	Expected Behavior
16.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
17.	TN1 transmits a Decline message to the NUT port 546.	
18.	Observe the messages transmitted on Link A.	The NUT discards the Decline message from TN1 and does not transmit any packets.

Part G: Release message (type 8)

Step	Action	Expected Behavior
19.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
20.	TN1 transmits a Release message to the NUT port 546.	
21.	Observe the messages transmitted on Link A.	The NUT discards the Release message from TN1 and does not transmit any packets.

Part H: Information-request message (type 11)

Step	Action	Expected Behavior
22.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
23.	TN1 transmits a Information-request message to the NUT port 546.	
24.	Observe the messages transmitted on Link A.	The NUT discards the Information-request message from TN1 and does not transmit any packets.

Part I: Relay-forward message (type 12)

Step	Action	Expected Behavior
25.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
26.	TN1 transmits a Relay-forward message to the NUT port 546.	
27.	Observe the messages transmitted on Link A.	The NUT discards the Relay-forward message from TN1 and does not transmit any packets.

Part J: Relay-reply message (type 13)

Step	Action	Expected Behavior
28.	Upon the reception of an Information-request message from the NUT, TN1 transmits a properly formatted Reply message.	
29.	TN1 transmits a Relay-reply message to the NUT port 546.	
30.	Observe the messages transmitted on Link A.	The NUT discards the Relay-reply message from TN1 and does not transmit any packets.

Possible Problems:

- The DUT may send a Destination Unreachable messages in response to each message type intended for the server.

Test DHCP_Conf.5.1.12: Client DHCP Unique Identifier Contents

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

Reference:

- [8415] – Sections 11.2, 11.3, 11.4 and 11.5

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

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Solicit message containing a DUID Option. The option has: • An option-code set to OPTION_CLIENTID(1) • An option-length set to the length of DUID in octets • A valid DUID Value.

Part B: DUID-LLT Consistency

Step	Action	Expected Behavior
3.	Enable DHCPv6 on the NUT.	
4.	Observe the messages transmitted on Link A.	The NUT transmits a properly formatted Information-Request message containing a DUID Option.
5.	Reboot the NUT.	
6.	Enable DHCPv6 on the NUT.	
7.	Observe the messages transmitted on Link A.	The NUT must transmit an Information-Request message with the identical DUID option containing the same values as in Step 4.

Possible Problems:

- None

Test DHCP_Conf.5.1.13: Refreshing Configuration Information

Purpose: To verify that a client properly performs a single exchange with a server after it has detected a network change.

Reference:

- [8415] – Section 18.2.12

Test Setup: Connect the network as described in the Common Topology. Common Test Setup 1.4 is performed before each part. DHCPv6 is disabled on the client device after each part.

Procedure:

Part A: Information-Request after Reboot

Step	Action	Expected Behavior
1.	Enable DHCPv6 on the NUT.	
2.	Observe the messages transmitted on Link A.	The NUT should transmit an Information-Request message.
3.	TN1 transmits a Reply message.	
4.	Reboot the NUT.	
5.	Observe the messages transmitted on Link A.	The NUT should transmit an Information-Request message.

Part B: Information-Request after Reconnect

Step	Action	Expected Behavior
6.	Enable DHCPv6 on the NUT.	
7.	Observe the messages transmitted on Link A.	The NUT should transmit an Information-Request message.
8.	TN1 transmits a Reply message.	
9.	Disconnect the NUT from Net1. Wait for the NUT to register link-down, then reconnect the NUT.	
10.	Observe the messages transmitted on Link A.	The NUT should transmit an Information-Request message.

Possible Problems:

- None.

Modification Record

Verstion 2.0.0a Jan 26, 2021

- Updates for RFC 8415
- Combine 1.1.4 and 5.1.12 into just parts A,B

Version 1.1.5 Jan 10, 2020

- Removed Phase-2.
- Added a Possible Problem to 1.2.7 to allow for device that only transmit one Release message.
- Modified 1.1.3 to not require a transaction-id of non-zero in Solicit messages.
- Changed the method for trigger a Confirm message to allow for more methods then disabling and re-enabling the interface.
- Removed elapsed timer check in 1.2.4D that is already covered in 1.2.4C.
- Updated 1.3.2E to now verify for both Echo Reply and Renew message.
- Updated 7.1.6 to only send DHCPv6 for the search list verification.
- Included validation for DNS Options in 4.1.10
- Added a time recommendation in 1.2.2B.
- Changed released address to configured address in 1.3.3k.
- Added Possible Problem to DHCP_CONF.1.3.6 and DHCP_CONF.7.1.8 for allowing Destination Unreachable messages.
- Updated T2 timer (2000 to 3000) in 1.2.5C.

Version 1.1.4 Mar 6, 2012

- Modify Test DHCP_CONF.1.2.7 Part F and Test DHCP_CONF.10.2.6 Part E

Jan 16, 2012

- Modify Test DHCP_CONF.10.3.4 Part B

July 11, 2011

- Modify Test DHCP_CONF.1.3.3 Part H, Test DHCP_CONF.10.3.3 Part D.

Jan 10, 2011

- Renumber and move the cases added on Nov 17 to the end of each section to keep the previous number for other cases. Test DHCP_CONF.4.1.1, Test DHCP_CONF.5.1.1, Test DHCP_CONF.7.1.5, Test DHCP_CONF.11.1.9, Test DHCP_CONF.12.1.2, Test DHCP_CONF.13.1.3 changed to be Test

DHCP_CONF.4.1.10, Test DHCP_CONF.5.1.8, Test DHCP_CONF.7.1.9, Test DHCP_CONF.11.1.9, Test DHCP_CONF.12.1.7, Test DHCP_CONF.13.1.8

Version 1.1.3 Nov 17, 2010

- Add test cases to verify DUID format of DHCPv6 messages: Test DHCP_CONF.4.1.1, Test DHCP_CONF.5.1.1, Test DHCP_CONF.7.1.5, Test DHCP_CONF.11.1.9, Test DHCP_CONF.12.1.2, Test DHCP_CONF.13.1.3

Version1.1.2

July 27, 2010

- Modify Test DHCP_CONF.1.3.3 Part H, Test DHCP_CONF.10.3.3 Part D, Test DHCP_CONF.11.3.3. Part A, Part C, Part D.

Version 1.1.1 April 27, 2010

- Modify the table of contents.

April 13, 2010

- Modify Test DHCP_CONF.1.2.3, Test DHCP_CONF.1.2.7, Test DHCP_CONF.1.2.8, Test DHCP_CONF.10.2.3, Test DHCP_CONF.10.2.6

March 5, 2010

- Modify Test DHCP_CONF.7.1.1, Test DHCP_CONF.7.1.2, Test DHCP_CONF.7.1.6

Version 1.1.0 December 10, 2009

- Modify Test DHCP_CONF.1.1.6, Test DHCP_CONF.1.1.7

December 8, 2009

- Modify Test DHCP_CONF.11.3.4 Part A, Test DHCP_CONF.11.3.5 Part A.

November 29, 2009

- Modify Test DHCP_CONF.2.3.4 Part A, Test DHCP_CONF.2.3.5 Part A, Test DHCP_CONF.2.3.6 Part A,, Test DHCP_CONF.2.3.7 Part A,
- Removed Figure 6 Common Topology 2 for Relay Agent.
- Modify Figure 4 Common Topology 2 for Delegating router
- Modify Common Topology 1 for DHCPv6 client and Common Test Setup 1.1.

November 11, 2009

- Modify Figure 1 Common Topology 1 for DHCPv6 client and Common Test Setup 1.1.
- Modify Figure 4 Common Topology 2 for Delegating router
- Modify Test DHCP_CONF.11.1.8: Status Code Option Format, Test DHCP_CONF.1.1.1 Part B and Test DHCP_CONF.1.2.4 Part E

November 3, 2009

- Modify the observer result for Test DHCP_CONF.1.2.3 Part C, Part D, Test DHCP_CONF.1.2.4 Part C, Part D, Test DHCP_CONF.1.2.7 Part D, Test DHCP_CONF.10.2.3 Part C, Part D, Test DHCP_CONF.10.2.6 Part C

- Add Test DHCP_CONF.1.2.7 Part F, Test DHCP_CONF.10.2.6 Part E

October 31, 2009

- Fix the typo in Test DHCP_CONF.8.1.11 Part A

October 16, 2009

- Delete Test DHCP_CONF.11.1.5 Part B, Test DHCP_CONF.11.1.9, Test DHCP_CONF.11.1.10, Test DHCP_CONF.11.2.1 Part E,F , Test DHCP_CONF.11.2.3, Test DHCP_CONF.11.3.6

October 10, 2009

- Update the advanced function table

September 15, 2009

- Update the advanced function
- 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