

G3-PLC L3/L4 Interoperability Test  
Procedure Manual  
**ANNEX**

HATS Conference

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Systems)

Multimedia Communication Test Implementation Liaison Committee

### Revision history

| Version | Date of revision | Description   | Person in charge |
|---------|------------------|---|------------------|
| 1.0     | Nov 15, 2013     | Creation of the initial version of this ANNEX document  | Akiyama<br>Kato  |
| 1.1     | Jan 7, 2014      | Editorial error correction on 1.3.5.  | Akiyama<br>Kato  |
|         |                  | Deletion of sub-clauses of 2.2.3, 2.3.1 and 2.3.2 that have no test definition.                                 |                  |
|         |                  | Deletion of sub-clause 2.2.5 that overlaps with 2.2.1.  |                  |
|         |                  | Addition of ICMPv6 Echo Request and Reply steps into the sequence defined in sub-clause 2.1.4, 2.1.5 and 2.1.6. |                  |
|         |                  | Editorial correction on sub-clause 2.3.1.   |                  |
|         |                  | Other minor editorial corrections are made.   |                  |

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## Table of Contents

|   |           |
|---|-----------|
| <b>1. General Description</b>   | <b>4</b>  |
| 1.1. References   | 4         |
| 1.2. Correspondence with Test Procedures                                    | 5         |
| 1.3. Introduction   | 9         |
| 1.3.1. Purpose  | 9         |
| 1.3.2. Scope  | 9         |
| 1.3.3. System Configuration   | 10        |
| 1.3.4. Common Initial Sequence  | 11        |
| 1.3.5. Common Rules   | 11        |
| 1.3.5.1. Generation of IPv6 Interface Identifier                            | 11        |
| 1.3.5.2. Byte and Bit order   | 11        |
| 1.3.6. Common Setting   | 12        |
| <br>  |           |
| <b>2. TEST PROCEDURES</b>   | <b>13</b> |
| <br>  |           |
| <b>2.1. ICMPv6 Echo Request and Reply</b>                                   | <b>13</b> |
| 2.1.1. Generation and Transmission of ICMPv6 Echo Request message           | 14        |
| 2.1.2. Generation and Transmission of ICMPv6 Echo Reply message             | 17        |
| 2.1.3. Received IPv6 Packet Filtering on the destination address            | 20        |
| 2.1.4. Reception of ICMPv6 Echo Request message destined to all nodes group | 22        |
| 2.1.5. Reception of ICMPv6 with incorrect checksum                          | 28        |
| 2.1.6. Reception of ICMPv6 without valid checksum value                     | 34        |
| <br>  |           |
| <b>2.2. Reception of ICMPv6 Error Message</b>                               | <b>40</b> |
| 2.2.1. Reception of ICMPv6 Address Unreachable                              | 40        |
| 2.2.2. Reception of ICMPv6 Port Unreachable message                         | 46        |
| 2.2.3. Reception of ICMPv6 Time Exceeded message                            | 51        |
| 2.2.4. Reception of ICMPv6 Parameter Problem message                        | 56        |
| <br>  |           |
| <b>2.3. Transmission of ICMPv6 Error Messages</b>                           | <b>61</b> |
| 2.3.1. Transmission of ICMPv6 Parameter Problem message                     | 61        |
| <br>  |           |
| <b>2.4. UDP transmission and reception</b>                                  | <b>64</b> |
| 2.4.1. Reception of Unicast UDP packet                                      | 65        |
| 2.4.2. Transmission of Unicast UDP packet                                   | 68        |
| 2.4.3. Filtering of unicast UDP packet destined to the other                | 71        |
| 2.4.4. Reception of Multicast UDP packet                                    | 73        |
| 2.4.5. Transmission of Multicast UDP packet                                 | 76        |
| 2.4.6. Unicast UDP arrived on unavailable port number                       | 79        |
| <br>  |           |
| <b>3. TEST REPORTS</b>  | <b>82</b> |
| 3.1. Front Page   | 82        |
| 3.2. 2.1 ICMPv6 Echo Request and Reply                                      | 83        |
| 3.3. 2.2 Reception of ICMPv6 Error Message                                  | 84        |
| 3.4. 2.3 Transmission of ICMPv6 Error Messages                              | 84        |
| 3.5. 2.4 Reception of ICMPv6 Error Message                                  | 85        |

## 1. General Description

### 1.1. References

- (1) HATS: G3-PLC L3/L4 Interoperability Test Procedure Manual (Draft)
- (2) TTC: JJ-300.11 Homenetwork Communication Interface for ECHONET Lite (ITU-T G.9903 Narrow band OFDM PLC)

## 1.2. Correspondence with Test Procedures

Table 1.2-1 presents correspondence between the references and this specification..

Table 1.2-1 Correspondence with test procedures

| No. | Document Title / Section number and title  | clause in this document | Remark  |
|-----|--|-------------------------|---|
| 1   | <b>ITU-T Recommendation G.9901</b><br>Narrowband orthogonal frequency division multiplexing power line communication transceivers – power spectral density specification | N/A                     | out of scope  |
| 2   | <b>ITU-T Recommendation G.9903</b><br>Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks                    | N/A                     | out of scope  |
| 3   | <b>ARIB STD-84</b><br>電力線搬送通信設備 (10kHz~450kHz)   | N/A                     | out of scope  |
| 4   | <b>IETF RFC 4944</b><br>Transmission of IPv6 Packets over IEEE 802.15.4 Network (6LoWPAN)  | N/A                     | out of scope  |
| 5   | <b>IETF RFC 2460</b> Internet Protocol, Version 6 (IPv6) Specification   |                         |   |
|     | 1 Introduction   | N/A                     | No technical specification is defined here.               |
|     | 2 Terminology  | N/A                     | No technical specification is defined here.               |
|     | 3 IPv6 Header Format   | <b>2.1.1, 2.1.2</b>     |   |
|     | 4 IPv6 Extension Header  | N/A                     | No applicable technical specification is defined here.    |
|     | 4.1 Extension Header Order   | N/A                     | No applicable technical specification is defined here.    |
|     | 4.2 Options  | N/A                     | This function is not supported in this configuration.     |
|     | 4.3 Hop-by-Hop Options Header  | N/A                     | This function is not supported in this configuration.     |
|     | 4.4 Routing Header   | N/A                     | This function is not supported in this configuration.     |
|     | 4.5 Fragment Header  | N/A                     | This function is not supported in this configuration.     |
|     | 4.6 Destination Options Header   | N/A                     | This function is not supported in this configuration.     |
|     | 4.7 No Next Header   | N/A                     | This function is not supported in this configuration.     |
|     | 5 Packet Size Issues   | N/A                     | This may not happen in this configuration.                |
|     | 6 Flow Label   | N/A                     | This function is not supported in the base specification. |
|     | 7 Traffic Classes  | N/A                     | This function is not supported in the base specification. |
|     | 8 Upper-Layer Protocol Issues  | N/A                     | No applicable technical specification is defined here.    |

| No. | Document Title / Section number and title                     | clause in this document | Remark  |
|-----|---|-------------------------|---|
|     | 8.1 Upper-Layer Checksum                                      | N/A                     | No applicable technical specification is defined here.    |
|     | 8.2 Maximum Packet Lifetime                                   | N/A                     | No applicable technical specification is defined here.    |
|     | 8.3 Maximum Upper-Layer Payload Size                          | N/A                     | No applicable technical specification is defined here.    |
|     | 8.4 Responding to Packets Carrying Routing Header             | N/A                     | This function is not supported in the base specification. |
| 6   | <b>IETF RFC 4862 IPv6 Stateless Address Autoconfiguration</b> |                         |   |
|     | 1 Introduction  | N/A                     | No technical specification is defined here.               |
|     | 2 Terminology   | N/A                     | No technical specification is defined here.               |
|     | 2.1 Requirements  | N/A                     | No technical specification is defined here.               |
|     | 3 Design Goals  | N/A                     | No technical specification is defined here.               |
|     | 4 Protocol Overview   | N/A                     | No technical specification is defined here.               |
|     | 4.1 Site Renumbering  | N/A                     | No technical specification is explicitly defined here..   |
|     | 5 Protocol Specification                                      | N/A                     | No technical specification is defined here.               |
|     | 5.1 Node Configuration Variables                              | N/A                     | DAD is not used in G3-PLC network.                        |
|     | 5.2 Autoconfiguration-Related Structures                      | N/A                     | DAD is not used in G3-PLC network.                        |
|     | 5.3 Creation of Link-Local Addresses                          | <b>2.1.1, 2.1.2</b>     |   |
|     | 5.4 Duplicate Address Detection                               | N/A                     | DAD is not used in G3-PLC network.                        |
|     | 5.4.1 Message Validation                                      | N/A                     | Neighbor Discovery defined in RFC 4861 is not applicable. |
|     | 5.4.2 Sending Neighbor Solicitation Messages                  | N/A                     | Neighbor Discovery defined in RFC 4861 is not applicable. |
|     | 5.4.3 Receiving Neighbor Solicitation Messages                | N/A                     | Neighbor Discovery defined in RFC 4861 is not applicable. |
|     | 5.4.4 Receiving Neighbor Advertisement Messages               | N/A                     | Neighbor Discovery defined in RFC 4861 is not applicable. |
|     | 5.4.5 When Duplicate Address Detection Fails                  | N/A                     | DAD is not used in G3-PLC network.                        |
|     | 5.5 Creation of Global Addresses                              | N/A                     | No applicable technical specification is defined here.    |
|     | 5.5.1 Soliciting Router Advertisements                        | N/A                     | No applicable technical specification is defined here.    |
|     | 5.5.2 Absence of Router Advertisements                        | N/A                     | No applicable technical specification is defined here.    |
|     | 5.5.3 Router Advertisement Processing                         | N/A                     | No applicable technical specification is defined here.    |
|     | 5.5.4 Address Lifetime Expiry                                 | N/A                     | No applicable technical                                   |

| No. | Document Title / Section number and title  | clause in this document      | Remark   |
|-----|--|------------------------------|--|
|     |  |                              | specification is defined here.                         |
|     | 5.6 Configuration Consistency  | N/A                          | No applicable technical specification is defined here. |
|     | 5.7 Retaining Configured Addresses for Stability   | N/A                          | No applicable technical specification is defined here. |
|     | 6 Security Considerations  | N/A                          | No applicable technical specification is defined here. |
| 7   | <b>IETF RFC 4443</b> Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification |                              |  |
|     | 1 Introduction   | N/A                          | No technical specification is defined here.            |
|     | 2 ICMPv6 (ICMP for IPv6)   | N/A                          | No technical specification is defined here.            |
|     | 2.1 Message General Format   | 2.1.1, 2.1.2                 |  |
|     | 2.2 Message Source Address Determination   | 2.1.1, 2.1.2                 |  |
|     | 2.3 Message Checksum Calculation   | 2.1.5, 2.1.6                 |  |
|     | 2.4 Message Processing Rules   | 2.2.1, 2.2.2<br>2.2.3, 2.2.4 |  |
|     | 3 ICMPv6 Error Messages  | N/A                          | No applicable technical specification is defined here. |
|     | 3.1 Destination Unreachable Message  | N/A                          | This message is never generated on G3-PLC network.     |
|     | 3.2 Packet Too Big Message   | N/A                          | This message is never generated on G3-PLC network.     |
|     | 3.3 Time Exceeded Message  | N/A                          | This message is never generated on G3-PLC network.     |
|     | 3.4 Parameter Problem Message  | 2.3.1                        |  |
|     | 4 ICMPv6 Informational Messages  | N/A                          | No technical specification is defined here.            |
|     | 4.1 Echo Request Message   | 2.1.1                        |  |
|     | 4.2 Echo Reply Message   | 2.1.2                        |  |
|     | 5 Security Considerations  | N/A                          | No technical specification is defined here.            |
|     | 5.1 Authentication and Confidentiality of ICMP Messages  | N/A                          | No applicable technical specification is defined here. |
|     | 5.2 ICMP Attacks   | N/A                          | No applicable technical specification is defined here. |
|     | 6 IANA Considerations  | N/A                          | No technical specification is defined here.            |
|     | 6.1 Procedure for New ICMPV6 Type and Code Value Assignments   | N/A                          | No applicable technical specification is defined here. |
|     | 6.2 Assignments for This Document  | N/A                          | No applicable technical specification is defined here. |
| 8   | <b>IETF RFC 768</b> User Datagram Protocol (UDP)   |                              |  |
|     | - Introduction   | N/A                          | No technical specification is defined here.            |

| No. | Document Title / Section number and title          | clause in this document          | Remark   |
|-----|--|----------------------------------|--|
|     | - Format   | <b>2.4.1 2.4.2, 2.4.4, 2.4.5</b> |  |
|     | - Fields   | <b>2.4.1, 2.4.2 2.4.4 2.4.5</b>  |  |
|     | - User Interface                                   | N/A                              | No applicable technical specification is defined here. |
|     | - IP Interface                                     | N/A                              | No applicable technical specification is defined here. |
|     | - Protocol Application                             | N/A                              | No applicable technical specification is defined here. |
|     | - Protocol Number                                  | N/A                              | No applicable technical specification is defined here. |
| 9   | <b>The ECHONET Lite Specification Version 1.01</b> | N/A                              |  |



### 1.3. Introduction

#### 1.3.1. Purpose

This document specifies the conformance test specification regarding layer 3 (L3) and layer 4 (L4) of the protocols implemented into G3-PLC devices.

#### 1.3.2. Scope

The test cases defined in this document intend to verify conformity of subject device called as DUT herein, regarding technical specifications of L3/L4 protocols. Target protocols of this specification are:

- IPv6
- ICMPv6
- UDP

Since this specification is focused on the extent necessary on the testing for G3-PLC, coverage is limited and wide variety of testing against subjected protocols is out of scope of this document.

1.3.3. System Configuration

Figure 1.3.3-1 shows the system configuration used in this test specification.

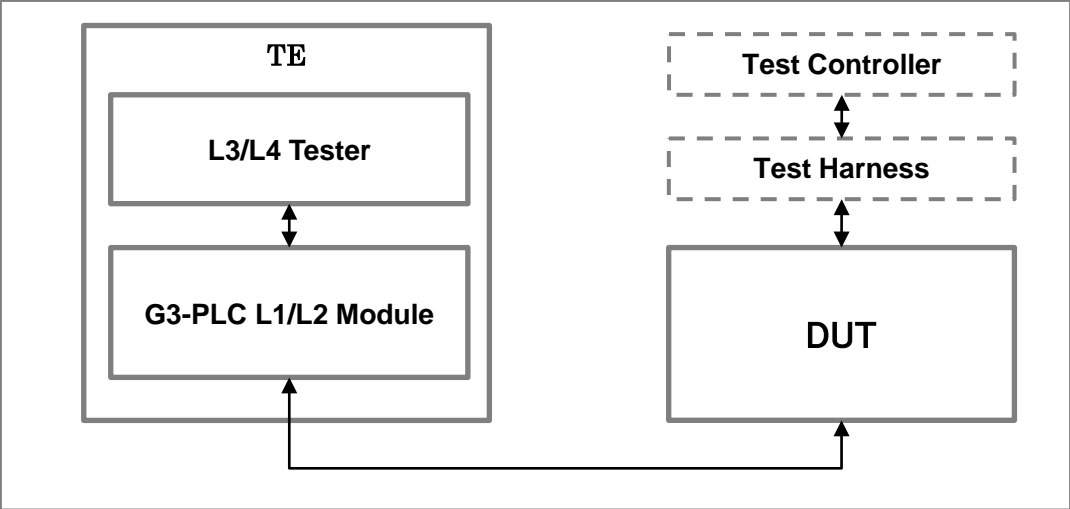


Figure 1.3.3-1 System Configuration

DUT (Device Under Test) shall be target device to be verified on this test specification. Actual system assumed on this test specification consists of inter-connection with a pair of a PAN coordinator and an end device. DUT shall have ability to work as either of PAN coordinator, end device or both of them.

TE (Test Equipment) consists of “G3-PLC L1/L2 module” and “L3/L4 Tester”. “G3-PLC L1/L2 module” shall be a G3-PLC module which has been certified regarding L1/L2 including 6LoWPAN, in accordance with the certification program established by G3-PLC Alliance.

When DUT works as PAN coordinator on the testing, TE shall work as an end device on opposite side. On the other hand, when DUT is verified as an end device, TE shall work as PAN coordinator.

“L3/L4 Tester” shall be single equipment or a set of equipment, which have abilities to control G3-PLC L1/L2 Module, and it shall also have function to generate, transmit, receive and parse L3/L4 packets, in accordance with the test cases defined in this document.

When DUT does not have any function for control and operation, it shall be able to deploy and use Test Controller and/or Test Harness instead for such purpose. DUT shall have ability to observe received UDP, IPv6 and ICMPv6 packet, by operating together with the Test Controller or by stand-alone DUT.

### 1.3.4. Common Initial Sequence

Test cases assume that the common initial sequence is executed in advance of individual test cases. This sequence is expressed as “Common Initial Sequence” hereafter.

In the Common Initial Sequence, required configuration and network establishment on L1 and L2 are assumed to be done, and then TE and DUT shall be able to communicate with each other on regarding L1 and L2 and to convey L3/L4 packets by putting it into payload of the L2 frame.

If any different sequences need to be done on the test case, it shall be specified in the corresponding section defined regarding test case.

### 1.3.5. Common Rules

#### 1.3.5.1. Generation of IPv6 Interface Identifier

In this specification, address expressed as “IPv6 Interface Identifier” shall be generated from PAN ID and short address of the device as follows:

|       |         |    |    |    |    |               |   |   |
|-------|---------|----|----|----|----|---------------|---|---|
| Octet | 0       | 1  | 2  | 3  | 4  | 5             | 6 | 7 |
|       | PAN ID* | 00 | FF | FE | 00 | Short address |   |   |

PAN ID\* - complement the “universal/local” (U/L) bit, which is the next to lowest order bit of the first octet.

#### 1.3.5.2. Byte and Bit order

Regarding the frame format and contents specified in this document, unless otherwise noted, the byte order shall be expressed in most significant byte first, and the bit order shall be expressed in most significant bit first.

## 1.3.6. Common Setting

Table 1.3.6-1 presents parameters commonly used throughout this specification.

Table 1.3.6-1 Common Setting

| Parameter                        | Value                                  | Remarks          |
|----------------------------------|--|------------------|
| PAN ID                           | 0xCAFE                                 |                  |
| MAC address of TE                | 0x0000                                 |                  |
| IPv6 Interface Identifier of TE  | 0xC8FE00FFFE000000                     | Based on 1.3.5.1 |
| IPv6 address of TE               | 0xFE80000000000000<br>C8FE00FFFE000000 |                  |
| MAC Address of DUT               | 0x0001                                 |                  |
| IPv6 Interface Identifier of DUT | 0xC8FE00FFFE000001                     | Based on 1.3.5.1 |
| IPv6 address of DUT              | 0xFE80000000000000<br>C8FE00FFFE000001 |                  |

## 2. Test Procedures

### 2.1. ICMPv6 Echo Request and Reply

This section presents test cases to verify:

- (1) DUT is able to generate ICMPv6 Echo Request message which has correct format.
- (2) DUT is able to respond to ICMPv6 Echo Request message by ICMPv6 Echo Reply message which has correct format.
- (3) DUT does not respond to ICMPv6 Echo Request message destined to any other node.
- (4) DUT is able to respond to ICMPv6 Echo Request message destined to all nodes by sending ICMPv6 Echo Reply message which has correct format.
- (5) DUT is able to calculate checksum code for ICMPv6 message correctly.
- (6) DUT does not respond to ICMPv6 Echo Request message which has incorrect checksum code.

Detail of these test cases is defined in following subsection.

### 2.1.1. Generation and Transmission of ICMPv6 Echo Request message

This test case verifies if DUT is able to generate ICMPv6 Echo Request message which has correct format.

(1) Test Procedure

**STEP1:** Transmit F1 (ICMPv6 Echo Request message destined to TE) from DUT, by using control command or other equivalent function which DUT provides,.

**STEP2:** TE receives F1 from DUT, and then TE responds to this by sending F2 (ICMPv6 Echo Reply message).

(2) Message Sequence

Figure 2.1.1-1 shows message sequence on this test case.

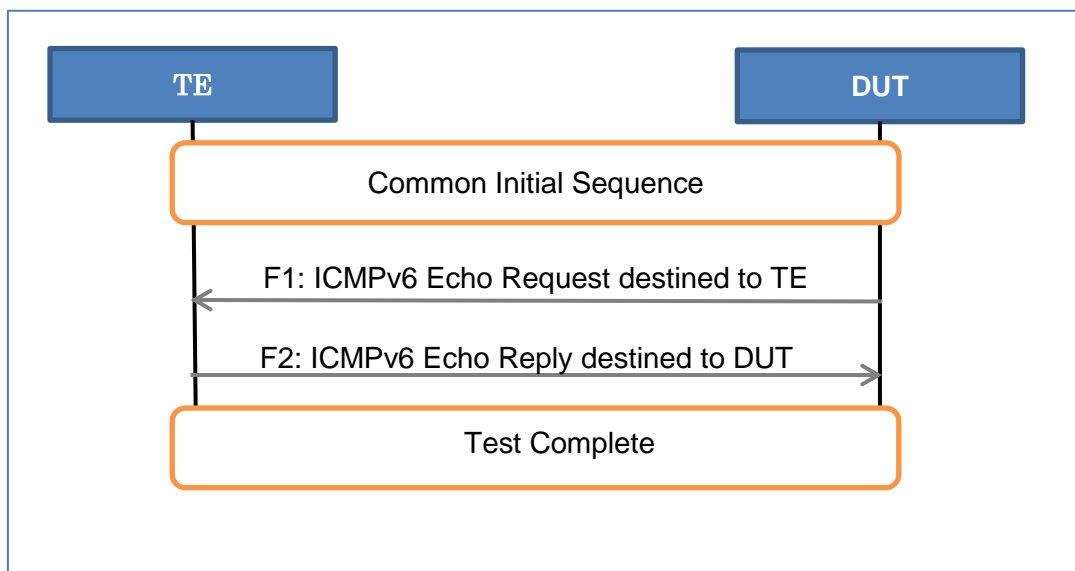


Figure 2.1.1-1 Message Sequence on Generation and Sending of ICMPv6 Echo Request message

## (3) Packet Definition

Each packets used in this test case are defined in the tables below. IPv6 Interface Identifier part in each address shall be generated from PAN ID and short address assigned to the node (TE or DUT), except multicast group address.

Table 2.1.1-1 F1: ICMPv6 Echo Request transmitted by DUT

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | ID                                     | 16            | Dynamically assigned by DUT.  |
|                | Sequence            | S                                      | 16            | Dynamically assigned by DUT   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| ICMPv6 message | 8000 xxxx xxxx xxxx<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that this value is variable or allocated dynamically.

Table 2.1.1-2 F2: ICMPv6 Echo Reply responded by TE

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0028 | 16            |         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                | Hop limit           | any value                              | 8             |                                       |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | ID                                     | 16            | Must be same ID as F1..               |
|                | Sequence            | S                                      | 16            | Must be same S as F1.                 |
|                | Data                | arbitrary                              | 256           | Must be same Data as F1.              |

● Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 8100 xxxx xxxx xxxx |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Echo Request message (F1) from DUT. |



### 2.1.2. Generation and Transmission of ICMPv6 Echo Reply message

This test case verifies if DUT is able to receive ICMPv6 Echo Request message and respond to it by generating and sending of ICMPv6 Echo Reply message which has correct format and contents.

(1) Test Procedure

**STEP1:** Transmit **F1** (ICMPv6 Echo Request destined to DUT) from TE.

**STEP2:** Confirm if TE have received F2 from DUT..

(2) Message Sequence

Figure 2.1.2-1 shows message sequence on this test case.

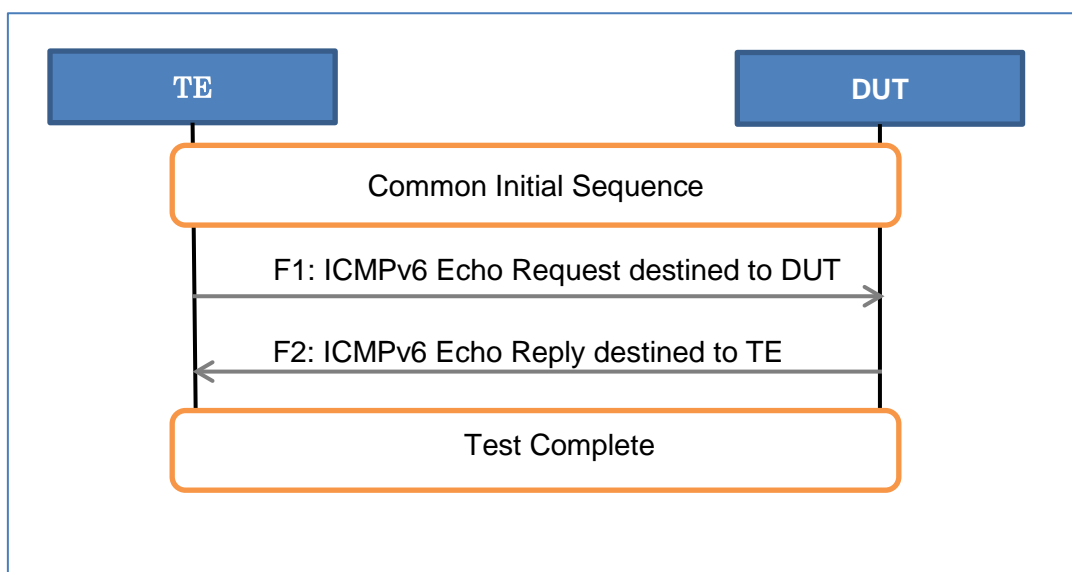


Figure 2.1.2-1 Message Sequence on Generation and Transmission of ICMPv6 Echo Reply

(3) Packet Definition

Table 2.1.2-1 F1: ICMPv6 Echo Request responded by TE

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly.                                       |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0000                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0000<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.2-2 F2: ICMPv6 Echo Reply responded by DUT.

| Layer       | Field          | Value  | Length (bits) | Comment     |
|-------------|----------------|--------|---------------|-------------|
| IPv6 Header | Version        | 6      | 4             |             |
|             | Traffic class  | 0      | 8             |             |
|             | Flow Label     | 0      | 20            |             |
|             | Payload length | 0x0028 | 16            |             |
|             | Next header    | 0x3A   | 8             | ICMPv6 (58) |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                | Hop limit           | any value                              | 8             |                                       |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | Must be same as source address in F1. |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Request (129)                    |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            | Must be same ID as F1.                |
|                | Sequence            | 0x0000                                 | 16            | Must be same S as F1.                 |
|                | Data                | arbitrary                              | 256           | Must be same data as F1               |

● Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0000 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Echo Reply message (F2) from DUT. |

### 2.1.3. Received IPv6 Packet Filtering on the destination address

This test case verifies if DUT does not receive any IPv6 packet destined to any others, and not respond to it.

(1) Test Procedure

**STEP1:** Transmit **F1** (ICMPv6 Echo Request message not destined to DUT) from TE.

**STEP2:** Confirm that no response is transmitted from DUT.

(2) Message Sequence

Figure 2.1.3-1 shows message sequence on this test case.

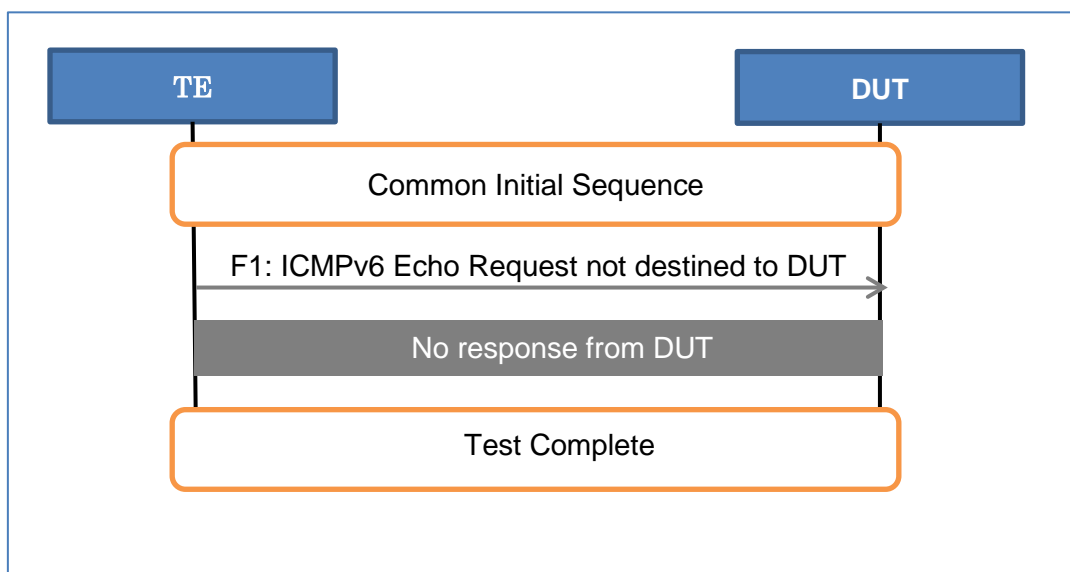


Figure 2.1.3-1 Message Sequence on IPv6 Packet Filtering on the destination address

## (3) Packet Definition

Table 2.1.3-1 F1: ICMPv6 Echo Request not destined to DUT

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE0000FF | 128           | Any other destination than DUT.   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly.                                       |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0000                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 00FF |
| ICMPv6 message | 8000 xxxx 0001 0000 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

## (4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts                                |
|----------|---|
| Step2    | No response shall be received from DUT. |

#### 2.1.4. Reception of ICMPv6 Echo Request message destined to all nodes group

This test case verifies that DUT does not respond to ICMPv6 Echo Request message destined to all nodes.

##### (1) Test Procedure

- STEP1:** Transmit **F1** (ICMPv6 Echo Request destined to DUT) from TE.
- STEP2:** Confirm if TE have received F2 from DUT..
- STEP3:** Transmit **F3** (ICMPv6 Echo Request message destined to all nodes multicast group address) from TE.
- STEP4:** Confirm that no response is transmitted by DUT.
- STEP5:** Transmit **F4** (ICMPv6 Echo Request destined to DUT) from TE.
- STEP6:** Confirm that DUT is able to receive F4 and transmit F5 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

##### (2) Message Sequence

Figure 2.1.4-1 shows message sequence on this test case.

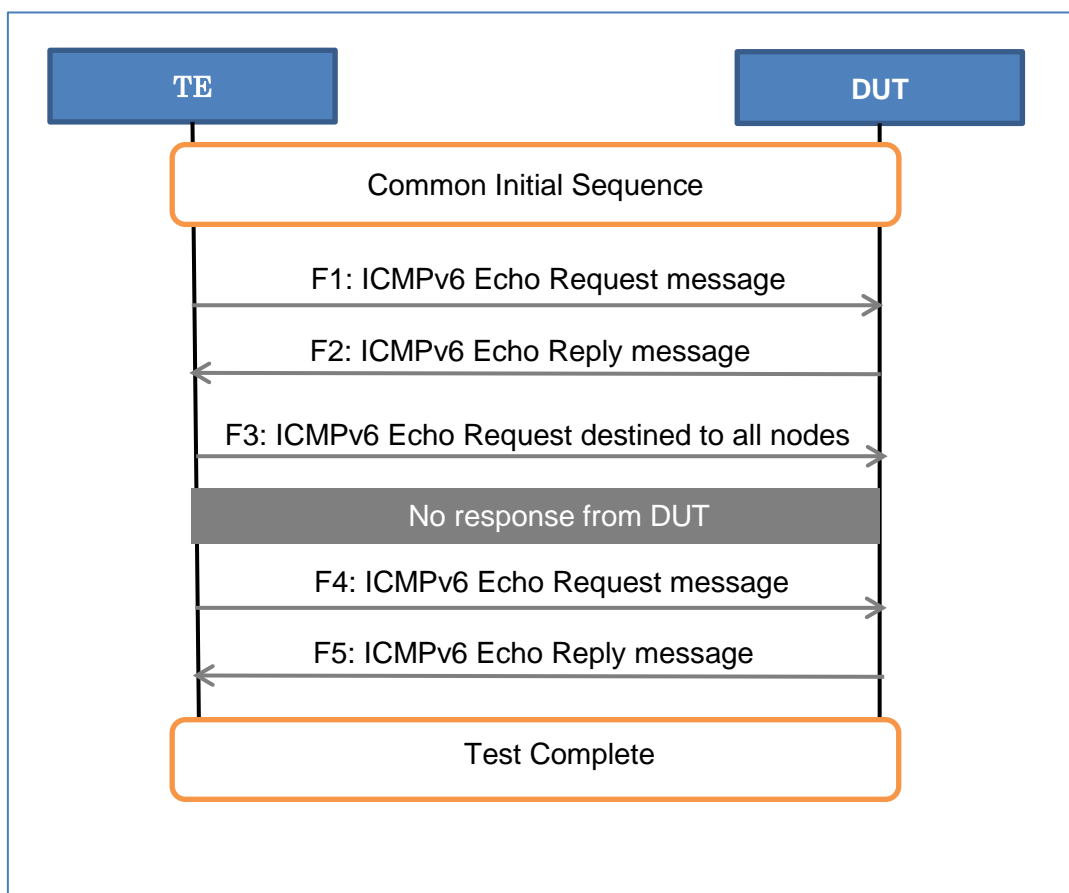


Figure 2.1.4-1 Message Sequence on Reception of ICMPv6 Echo Request destined to all nodes

## (3) Packet Definition

Table 2.1.4-1 F1: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0000                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0000<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.4-2 F2: ICMPv6 Echo Reply message

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0028 | 16            |         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                | Hop limit           | any value                              | 8             |                                       |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | ID                                     | 16            | Must be same ID as F1..               |
|                | Sequence            | S                                      | 16            | Must be same S as F1.                 |
|                | Data                | arbitrary                              | 256           | Must be same Data as F1.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0000 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.4-3 F3: ICMPv6 Echo Request destined to all nodes

| Layer          | Field               | Value                                  | Length (bits) | Comment                           |
|----------------|---------------------|--|---------------|-----------------------------------|
| IPv6 Header    | Version             | 6                                      | 4             |                                   |
|                | Traffic class       | 0                                      | 8             |                                   |
|                | Flow Label          | 0                                      | 20            |                                   |
|                | Payload length      | 0x0028                                 | 16            |                                   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                       |
|                | Hop limit           | any value                              | 8             |                                   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           |                                   |
|                | Destination address | FF02::1                                | 128           | All nodes multicast group address |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)                |
|                | code                | 0                                      | 8             |                                   |



| Layer | Field      | Value             | Length (bits) | Comment  |
|-------|------------|-------------------|---------------|--|
|       | Checksum   | CCCC              | 16            | 'CCCC' shall be calculated correctly.  |
|       | Identifier | 0x0001            | 16            |  |
|       | Sequence   | 0x0001            | 16            |  |
|       | Data       | "abc...xyzabcdef" | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter. |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FF02 0000 0000 0000<br>0000 0000 0000 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.4-4 F4: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0002                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0002 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.4-5 F5: ICMPv6 Echo Reply message

| Layer               | Field                                  | Value                                  | Length (bits) | Comment                               |
|---------------------|--|--|---------------|---------------------------------------|
| IPv6 Header         | Version                                | 6                                      | 4             |                                       |
|                     | Traffic class                          | 0                                      | 8             |                                       |
|                     | Flow Label                             | 0                                      | 20            |                                       |
|                     | Payload length                         | 0x0028                                 | 16            |                                       |
|                     | Next header                            | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                     | Hop limit                              | any value                              | 8             |                                       |
|                     | Source address                         | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
| Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                                    | TE            |                                       |
| ICMPv6 message      | Type                                   | 0x81                                   | 8             | Echo Reply (129)                      |
|                     | code                                   | 0                                      | 8             |                                       |
|                     | Checksum                               | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                     | Identifier                             | ID                                     | 16            | Must be same ID as F4..               |
|                     | Sequence                               | S                                      | 16            | Must be same S as F4.                 |
|                     | Data                                   | arbitrary                              | 256           | Must be same Data as F4.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0002 |
|                | 6162 6364 6566 6768 |

| Field | Code (Hex)  |
|-------|---|
|       | 696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Echo Reply message (F2) from DUT.   |
| Step4    | No response shall be received from DUT.  |
| Step6    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F4) and transmit ICMPv6 Echo Reply message (F5) as the response, without any problem. |

### 2.1.5. Reception of ICMPv6 with incorrect checksum

This test case verifies if DUT discards ICMPv6 Echo Request message which has incorrect checksum code, and does not respond to it.

#### (1) Test Procedure

**STEP1:** Transmit **F1** (ICMPv6 Echo Request destined to DUT) from TE.

**STEP2:** Confirm if TE have received F2 from DUT..

**STEP3:** Transmit **F3** (ICMPv6 Echo Request message which has wrong checksum code) from TE to DUT.

**STEP4:** Confirm that no response is transmitted by DUT.

**STEP5:** Transmit **F4** (ICMPv6 Echo Request destined to DUT) from TE.

**STEP6:** Confirm that DUT is able to receive F4 and transmit F5 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

#### (2) Message Sequence

Figure 2.1.5-1 shows message sequence on this test case.

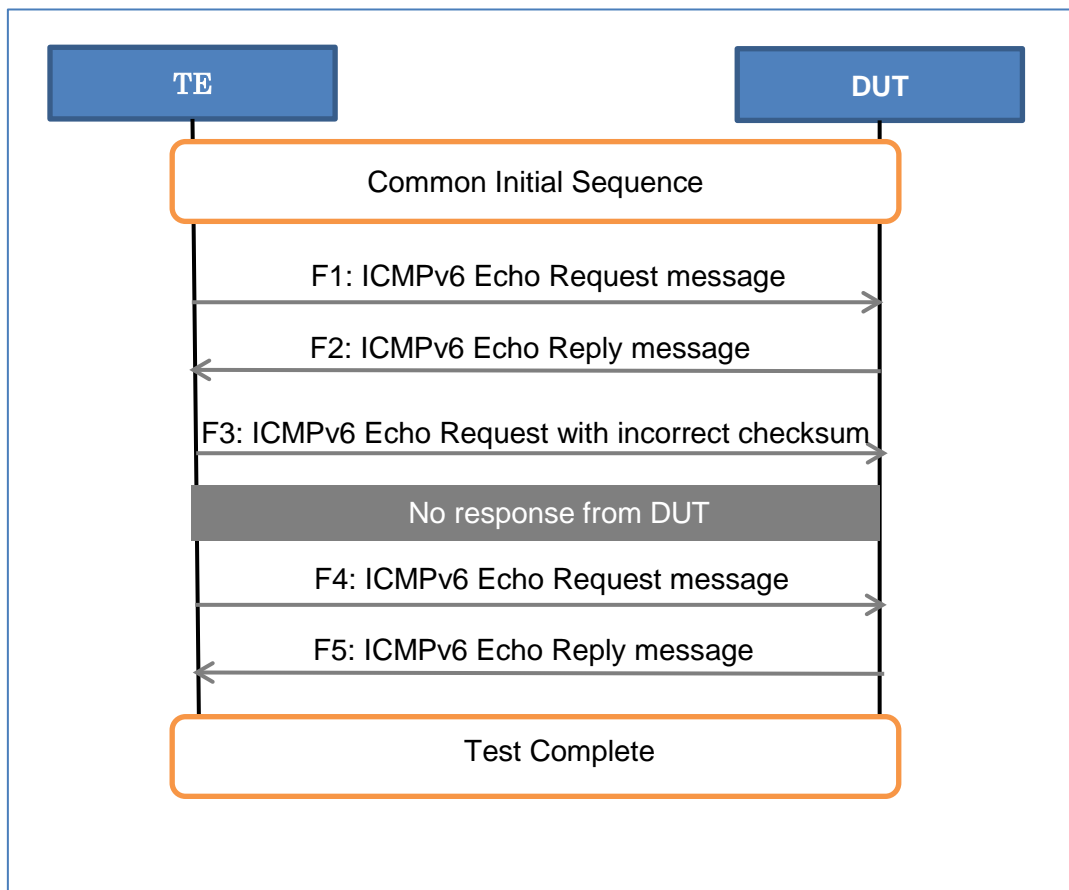


Figure 2.1.5-1 Message Sequence on Reception of ICMPv6 with incorrect checksum

## (3) Packet Definition

Table 2.1.5-1 F1: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0000                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0000<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.5-2 F2: ICMPv6 Echo Reply message

| Layer       | Field         | Value | Length (bits) | Comment |
|-------------|---------------|-------|---------------|---------|
| IPv6 Header | Version       | 6     | 4             |         |
|             | Traffic class | 0     | 8             |         |
|             | Flow Label    | 0     | 20            |         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                | Payload length      | 0x0028                                 | 16            |                                       |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                | Hop limit           | any value                              | 8             |                                       |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | ID                                     | 16            | Must be same ID as F1..               |
|                | Sequence            | S                                      | 16            | Must be same S as F1.                 |
|                | Data                | arbitrary                              | 256           | Must be same Data as F1.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0000 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Table 2.1.5-3 F3: ICMPv6 Echo Request with wrong checksum

| Layer          | Field               | Value                                  | Length (bits) | Comment            |
|----------------|---------------------|--|---------------|--------------------|
| IPv6 Header    | Version             | 6                                      | 4             |                    |
|                | Traffic class       | 0                                      | 8             |                    |
|                | Flow Label          | 0                                      | 20            |                    |
|                | Payload length      | 0x0028                                 | 16            |                    |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)        |
|                | Hop limit           | any value                              | 8             |                    |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                 |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128) |
|                | code                | 0                                      | 8             |                    |

| Layer | Field      | Value             | Length (bits) | Comment   |
|-------|------------|-------------------|---------------|---|
|       | Checksum   | CCCC              | 16            | 'CCCC' is wrong checksum.   |
|       | Identifier | 0x0001            | 16            |   |
|       | Sequence   | 0x0001            | 16            |   |
|       | Data       | "abc...xyzabcdef" | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.5-4 F4: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0002                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0002 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.5-5 F5: ICMPv6 Echo Reply message

| Layer               | Field                                  | Value                                  | Length (bits) | Comment                               |
|---------------------|--|--|---------------|---------------------------------------|
| IPv6 Header         | Version                                | 6                                      | 4             |                                       |
|                     | Traffic class                          | 0                                      | 8             |                                       |
|                     | Flow Label                             | 0                                      | 20            |                                       |
|                     | Payload length                         | 0x0028                                 | 16            |                                       |
|                     | Next header                            | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                     | Hop limit                              | any value                              | 8             |                                       |
|                     | Source address                         | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
| Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                                    | TE            |                                       |
| ICMPv6 message      | Type                                   | 0x81                                   | 8             | Echo Reply (129)                      |
|                     | code                                   | 0                                      | 8             |                                       |
|                     | Checksum                               | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                     | Identifier                             | ID                                     | 16            | Must be same ID as F4..               |
|                     | Sequence                               | S                                      | 16            | Must be same S as F4.                 |
|                     | Data                                   | arbitrary                              | 256           | Must be same Data as F4.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0002 |
|                | 6162 6364 6566 6768 |



| Field | Code (Hex)  |
|-------|---|
|       | 696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Echo Reply message (F2) from DUT.   |
| Step4    | No response shall be received from DUT.  |
| Step6    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F4) and transmit ICMPv6 Echo Reply message (F5) as the response, without any problem. |

### 2.1.6. Reception of ICMPv6 without valid checksum value

This test case verifies if DUT is able to drop ICMPv6 message which has checksum with value of 0x0000.

#### (1) Test Procedure

**STEP1:** Transmit **F1** (ICMPv6 Echo Request destined to DUT) from TE.

**STEP2:** Confirm if TE have received F2 from DUT..

**STEP3:** Transmit **F3** (ICMPv6 Echo Request message with 0x0000 of checksum value) from TE.

**STEP4:** Confirm that no response is transmitted by DUT.

**STEP5:** Transmit **F4** (ICMPv6 Echo Request destined to DUT) from TE.

**STEP6:** Confirm that DUT is able to receive F4 and transmit F5 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

#### (2) Test Procedure

Figure 2.1.6-1 shows message sequence on this test case.

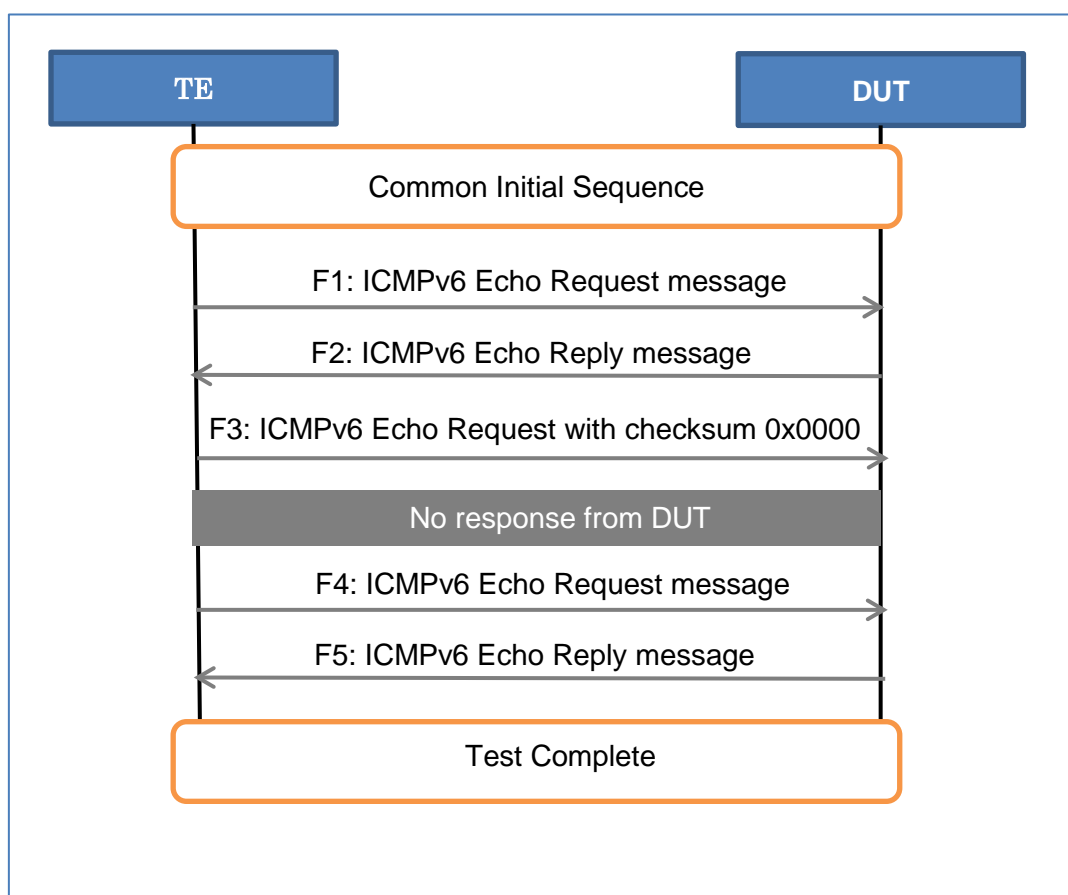


Figure 2.1.6-1 Message Sequence on Reception of ICMPv6 without valid checksum value

## (3) Packet Definition

Table 2.1.6-1 F1: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0000                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0000<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.6-2 F2: ICMPv6 Echo Reply message

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0028 | 16            |         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                | Hop limit           | any value                              | 8             |                                       |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | ID                                     | 16            | Must be same ID as F1..               |
|                | Sequence            | S                                      | 16            | Must be same S as F1.                 |
|                | Data                | arbitrary                              | 256           | Must be same Data as F1.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0000 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.6-3 F3: ICMPv6 Echo Request with null checksum code

| Layer       | Field               | Value                                  | Length (bits) | Comment            |
|-------------|---------------------|--|---------------|--------------------|
| IPv6 Header | Version             | 6                                      | 4             |                    |
|             | Traffic class       | 0                                      | 8             |                    |
|             | Flow Label          | 0                                      | 20            |                    |
|             | Payload length      | 0x0028                                 | 16            |                    |
|             | Next header         | 0x3A                                   | 8             | ICMPv6 (58)        |
|             | Hop limit           | any value                              | 8             |                    |
|             | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                 |
|             | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                |
| ICMPv6      | Type                | 0x80                                   | 8             | Echo Request (128) |

| Layer   | Field      | Value             | Length (bits) | Comment   |
|---------|------------|-------------------|---------------|---|
| message | code       | 0                 | 8             |   |
|         | Checksum   | 0x0000            | 16            | Checksum is omitted.  |
|         | Identifier | 0x0001            | 16            |   |
|         | Sequence   | 0x0001            | 16            |   |
|         | Data       | "abc...xyzabcdef" | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 0000 0001 0001 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.6-4 F4: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment                              |
|----------------|---------------------|--|---------------|--------------------------------------|
| IPv6 Header    | Version             | 6                                      | 4             |                                      |
|                | Traffic class       | 0                                      | 8             |                                      |
|                | Flow Label          | 0                                      | 20            |                                      |
|                | Payload length      | 0x0028                                 | 16            |                                      |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)                          |
|                | Hop limit           | any value                              | 8             |                                      |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                  |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)                   |
|                | code                | 0                                      | 8             |                                      |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly. |
|                | Identifier          | 0x0001                                 | 16            |                                      |
|                | Sequence            | 0x0002                                 | 16            |                                      |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string          |

| Layer | Field | Value | Length (bits) | Comment   |
|-------|-------|-------|---------------|---|
|       |       |       |               | that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0002<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.1.6-5 F5: ICMPv6 Echo Reply message

| Layer               | Field                                  | Value                                  | Length (bits) | Comment                               |
|---------------------|--|--|---------------|---------------------------------------|
| IPv6 Header         | Version                                | 6                                      | 4             |                                       |
|                     | Traffic class                          | 0                                      | 8             |                                       |
|                     | Flow Label                             | 0                                      | 20            |                                       |
|                     | Payload length                         | 0x0028                                 | 16            |                                       |
|                     | Next header                            | 0x3A                                   | 8             | ICMPv6 (58)                           |
|                     | Hop limit                              | any value                              | 8             |                                       |
|                     | Source address                         | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT                                   |
| Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                                    | TE            |                                       |
| ICMPv6 message      | Type                                   | 0x81                                   | 8             | Echo Reply (129)                      |
|                     | code                                   | 0                                      | 8             |                                       |
|                     | Checksum                               | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                     | Identifier                             | ID                                     | 16            | Must be same ID as F4..               |
|                     | Sequence                               | S                                      | 16            | Must be same S as F4.                 |
|                     | Data                                   | arbitrary                              | 256           | Must be same Data as F4.              |

- Frame Encoding

| Field       | Code (Hex)  |
|-------------|---|
| IPv6 Header | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |

| Field          | Code (Hex)  |
|----------------|---|
|                | FE80 0000 0000 0000<br>C8FE 00FF FE00 0000  |
| ICMPv6 message | 8100 xxxx 0001 0002<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Echo Reply message (F2) from DUT.   |
| Step4    | No response shall be received from DUT.  |
| Step6    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F4) and transmit ICMPv6 Echo Reply message (F5) as the response, without any problem. |

## 2.2. Reception of ICMPv6 Error Message

This section presents test cases which verify the behavior of DUT on receiving ICMPv6 Error message that are showed below.

1. Destination Unreachable (Address Unreachable)
2. Destination Unreachable (Port Unreachable)
3. Time Exceeded
4. Parameter Problem.

Packet Too Big message shall be excluded from the test target, since it will never appear within the subjected environment on this test specification.

The details of test cases are defined in each subsection below.

### 2.2.1. Reception of ICMPv6 Address Unreachable

This test case verifies that DUT does not originate any response message after receiving ICMPv6 Address Unreachable message against previous ICMPv6 Echo Request message transmitted by DUT.

Further, by running normal sequence of ICMPv6 Echo after that, verifies that DUT has no side effects, and works without any problem.

#### (1) Test Procedure

**STEP1:** Transmit F1 (ICMPv6 Echo Request message destined to TE) from DUT, by using control command or other equivalent function which DUT provides

**STEP2:** TE transmits F2 (Address Unreachable message) as response against F1 from DUT.

**STEP3:** Confirm that no response from DUT.

**STEP4:** Transmit F3 (ICMPv6 Echo Request message) from TE to DUT.

**STEP5:** Confirm that DUT is able to receive F3 and transmit F4 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.



(2) Message Sequence

Figure 2.2.1-1 shows message sequence on this test case.

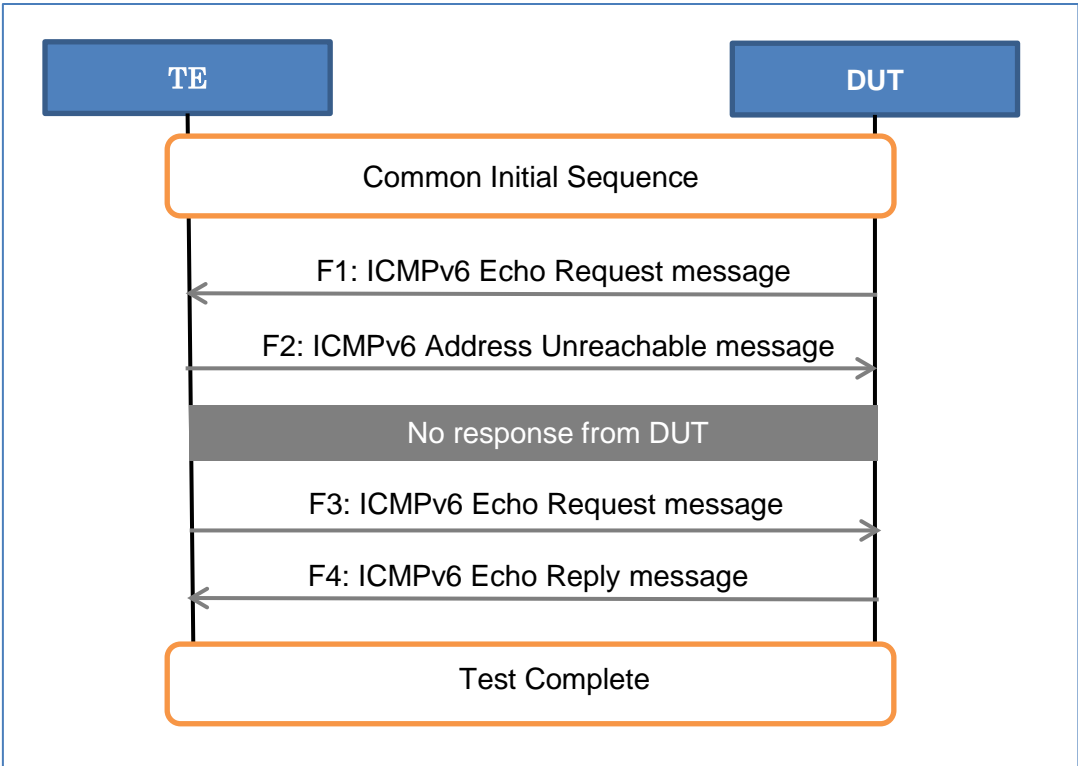


Figure 2.2.1-1 Message Sequence on Reception of ICMPv6 Address Unreachable

**(3) Packet Definition**

Each packets used in this test case are defined in the tables below. IPv6 Interface Identifier part in each address shall be generated from PAN ID and short address assigned to the node (TE or DUT), except multicast group address.

Table 2.2.1-1 F1: ICMPv6 Echo Request message

| Layer               | Field                                  | Value                                  | Length (bits) | Comment   |
|---------------------|--|--|---------------|---|
| IPv6 Header         | Version                                | 6                                      | 4             |   |
|                     | Traffic class                          | 0                                      | 8             |   |
|                     | Flow Label                             | 0                                      | 20            |   |
|                     | Payload length                         | 0x0028                                 | 16            |   |
|                     | Next header                            | 0x3A                                   | 8             | ICMPv6 (58)   |
|                     | Hop limit                              | any value                              | 8             |   |
|                     | Source address                         | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                                    | TE            |   |
| ICMPv6 message      | Type                                   | 0x80                                   | 8             | Echo Request (128)  |
|                     | code                                   | 0                                      | 8             |   |
|                     | Checksum                               | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                     | Identifier                             | ID                                     | 16            | ID is assigned dynamically by DUT.  |
|                     | Sequence                               | S                                      | 16            | S is assigned dynamically by DUT  |
|                     | Data                                   | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| ICMPv6 message | 8000 xxxx xxxx xxxx<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.1-2 F2: ICMPv6 Address Unreachable message

| Layer | Field   | Value | Length (bits) | Comment |
|-------|---------|-------|---------------|---------|
| IPv6  | Version | 6     | 4             |         |

| Layer          | Field               | Value                                  | Length (bits)              | Comment  |
|----------------|---------------------|--|----------------------------|--|
| Header         | Traffic class       | 0                                      | 8                          |  |
|                | Flow Label          | 0                                      | 20                         |  |
|                | Payload length      | 0x0058                                 | 16                         |  |
|                | Next header         | 0x3A                                   | 8                          | ICMPv6 (58)  |
|                | Hop limit           | any value                              | 8                          |  |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                        | TE   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128                        | DUT  |
| ICMPv6 message | Type                | 0x01                                   | 8                          | Destination Unreachable  |
|                | code                | 3                                      | 8                          | Address Unreachable  |
|                | Checksum            | CCCC                                   | 16                         | 'CCCC' must be calculated correctly.   |
|                | Unused              | 0                                      | 32                         |  |
|                | Data                | ICMPv6 packet defined on F1            | 80 octets *<br>8bits = 640 | Length of the Data shall be as much of F1 as will fit without the ICMPv6 packet exceeding the MTU. |

- Frame Encoding

| Field          | Code (Hex)                  |
|----------------|-----------------------------|
| IPv6 Header    | 6000 0000 0058 3A <b>xx</b> |
|                | FE80 0000 0000 0000         |
|                | C8FE 00FF FE00 0000         |
|                | FE80 0000 0000 0000         |
|                | C8FE 00FF FE00 0001         |
| ICMPv6 message | 0103 <b>xxxx</b> 0000 0000  |
|                | 6000 0000 0020 3A <b>xx</b> |
|                | FE80 0000 0000 0000         |
|                | C8FE 00FF FE00 0001         |
|                | FE80 0000 0000 0000         |
|                | C8FE 00FF FE00 0000         |
|                | 8000 <b>SSSS IIII QQQQ</b>  |
|                | 6162 6364 6566 6768         |
|                | 696A 6B6C 6D6E 6F70         |
|                | 7172 7374 7576 7778         |
|                | 797A 6162 6364 6566         |

Note: 'x' means that these values are variable or allocated dynamically.

'SSSS' means the value that has set into ICMPv6 checksum field of F1.

'IIII' means the value that has set into ICMPv6 identifier field of F1.

'QQQQ' means the value that has set into ICMPv6 sequence number field of F1.

Table 2.2.1-3 F3: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0001                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.1-4 F4: ICMPv6 Echo Reply message

| Layer       | Field          | Value              | Length (bits) | Comment     |
|-------------|----------------|--------------------|---------------|-------------|
| IPv6 Header | Version        | 6                  | 4             |             |
|             | Traffic class  | 0                  | 8             |             |
|             | Flow Label     | 0                  | 20            |             |
|             | Payload length | 0x0028             | 16            |             |
|             | Next header    | 0x3A               | 8             | ICMPv6 (58) |
|             | Hop limit      | any value          | 8             |             |
|             | Source address | 0xFE80000000000000 | 128           | DUT         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                |                     | C8FE00FFFE000001                       |               |                                       |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | ID                                     | 16            | Must be same ID as F3..               |
|                | Sequence            | S                                      | 16            | Must be same S as F3.                 |
|                | Data                | arbitrary                              | 256           | Must be same Data as F3.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0001 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step3    | No response must receive from DUT.<br>Observe received packet on DUT and confirm it is same as F1.   |
| Step5    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F3) and transmit ICMPv6 Echo Reply message (F4) as the response, without any problem. |

### 2.2.2. Reception of ICMPv6 Port Unreachable message

This test case verifies that DUT does not originate any response message after receiving ICMPv6 Port Unreachable message against previous UDP datagram transmitted by DUT..

Further, by running normal sequence of ICMPv6 Echo after that, verifies that DUT has no side effects, and works without any problem.

#### (1) Test Procedure

**STEP1:** Transmit F1 (UDP datagram) from DUT.

**STEP2:** TE transmits F2 (Port Unreachable message) as response against F3 from DUT.

**STEP3:** Confirm that no response from DUT.

**STEP4:** Transmit F3 (ICMPv6 Echo Request message) from TE to DUT.

**STEP5:** Confirm that DUT is able to receive F3 and transmit F4 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

#### (2) Message Sequence

Figure 2.2.2-1 shows message sequence on this test case.

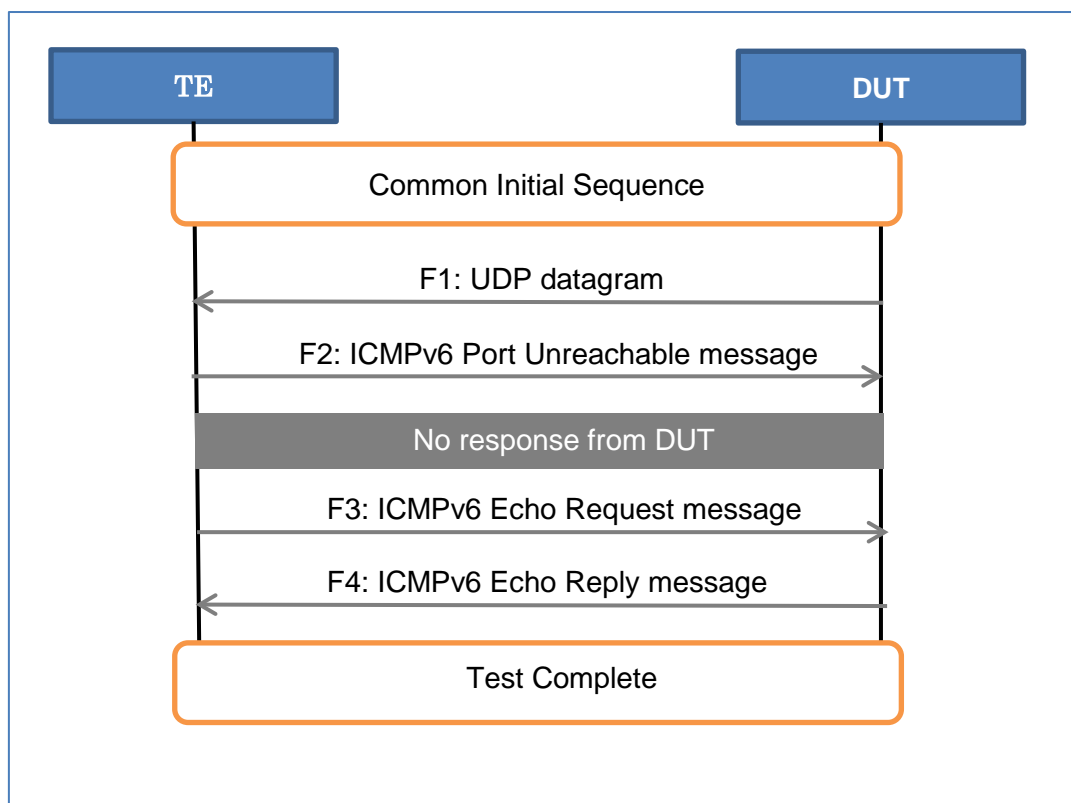


Figure 2.2.2-1 Message Sequence on Reception of ICMPv6 Port Unreachable

## (3) Packet Definition

Table 2.2.2-1 F1: UDP datagram

| Layer        | Field               | Value                                  | Length (bits) | Comment   |
|--------------|---------------------|--|---------------|---|
| IPv6 Header  | Version             | 6                                      | 4             |   |
|              | Traffic class       | 0                                      | 8             |   |
|              | Flow Label          | 0                                      | 20            |   |
|              | Payload length      | 0x0028                                 | 16            |   |
|              | Next header         | 0x11                                   | 8             | UDP (17)  |
|              | Hop limit           | any value                              | 8             |   |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|              | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| UDP datagram | Source port         | arbitrary                              | 16            | Dynamically allocated by DUT  |
|              | Destination port    | 3610                                   | 16            |   |
|              | Length              | 0x0028                                 | 16            | .L is length of the UDP datagram consist of UDP header and data part.       |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|              | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0028 11xx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| UDP datagram | xxxx 0E1A 0028 xxxx<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.2-2 F2: ICMPv6 Port Unreachable message

| Layer       | Field         | Value | Length (bits) | Comment |
|-------------|---------------|-------|---------------|---------|
| IPv6 Header | Version       | 6     | 4             |         |
|             | Traffic class | 0     | 8             |         |
|             | Flow Label    | 0     | 20            |         |

| Layer          | Field               | Value                                  | Length (bits)                 | Comment   |
|----------------|---------------------|--|-------------------------------|---|
|                | Payload length      | 0x0058                                 | 16                            |   |
|                | Next header         | 0x3A                                   | 8                             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8                             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128                           | DUT   |
| ICMPv6 message | Type                | 0x01                                   | 8                             | Destination Unreachable   |
|                | code                | 4                                      | 8                             | Address Unreachable   |
|                | Checksum            | CCCC                                   | 16                            | 'CCCC' must be calculated correctly.  |
|                | Unused              | 0                                      | 32                            |   |
|                | Data                | ICMPv6 packet defined on F1            | 80 octets *<br>8bits =<br>640 | N shall be as much of F1 as will fit without the ICMPv6 packet exceeding the MTU. |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0058 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001   |
| ICMPv6 message | 0104 xxxx 0000 0000<br>6000 0000 0028 11xx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>PPPP 0E1A 0028 SSSS<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

'PPPP' shall be same as source port number in the F1.

'SSSS' means the value that has set into UDP checksum field of the F1.

Table 2.2.2-3 F3: ICMPv6 Echo Request message

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0028 | 16            |         |



| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0001                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.2-4 F4: ICMPv6 Echo Reply message

| Layer          | Field               | Value                                  | Length (bits) | Comment          |
|----------------|---------------------|--|---------------|------------------|
| IPv6 Header    | Version             | 6                                      | 4             |                  |
|                | Traffic class       | 0                                      | 8             |                  |
|                | Flow Label          | 0                                      | 20            |                  |
|                | Payload length      | 0x0028                                 | 16            |                  |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)      |
|                | Hop limit           | any value                              | 8             |                  |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT              |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE               |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129) |
|                | code                | 0                                      | 8             |                  |

| Layer | Field      | Value     | Length (bits) | Comment                               |
|-------|------------|-----------|---------------|---------------------------------------|
|       | Checksum   | CCCC      | 16            | 'CCCC' shall be calculated correctly. |
|       | Identifier | 0x0001    | 16            | Must be same ID as F3..               |
|       | Sequence   | 0x0001    | 16            | Must be same S as F3.                 |
|       | Data       | arbitrary | 256           | Must be same Data as F3.              |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0001 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step3    | No response must receive from DUT.<br>Observe received packet on DUT and confirm it is same as F1.   |
| Step5    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F3) and transmit ICMPv6 Echo Reply message (F4) as the response, without any problem. |

### 2.2.3. Reception of ICMPv6 Time Exceeded message

This test case verifies that DUT does not originate any response message after receiving ICMPv6 Time Exceeded message against previous ICMPv6 Echo Request message transmitted by DUT.

Further, by running normal sequence of ICMPv6 Echo after that, verifies that DUT has no side effects, and works without any problem..

#### (1) Test Procedure

**STEP1:** Transmit F1 (ICMPv6 Echo Request message) from DUT.

**STEP2:** TE transmits F2 (Time Exceeded message) as response against F1 from DUT.

**STEP3:** Confirm that no response from DUT.

**STEP4:** Transmit F3 (ICMPv6 Echo Request message) from TE to DUT.

**STEP5:** Confirm that DUT is able to receive F3 and transmit F4 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

#### (2) Message Sequence

Figure 2.2.3-1 shows message sequence on this test case.

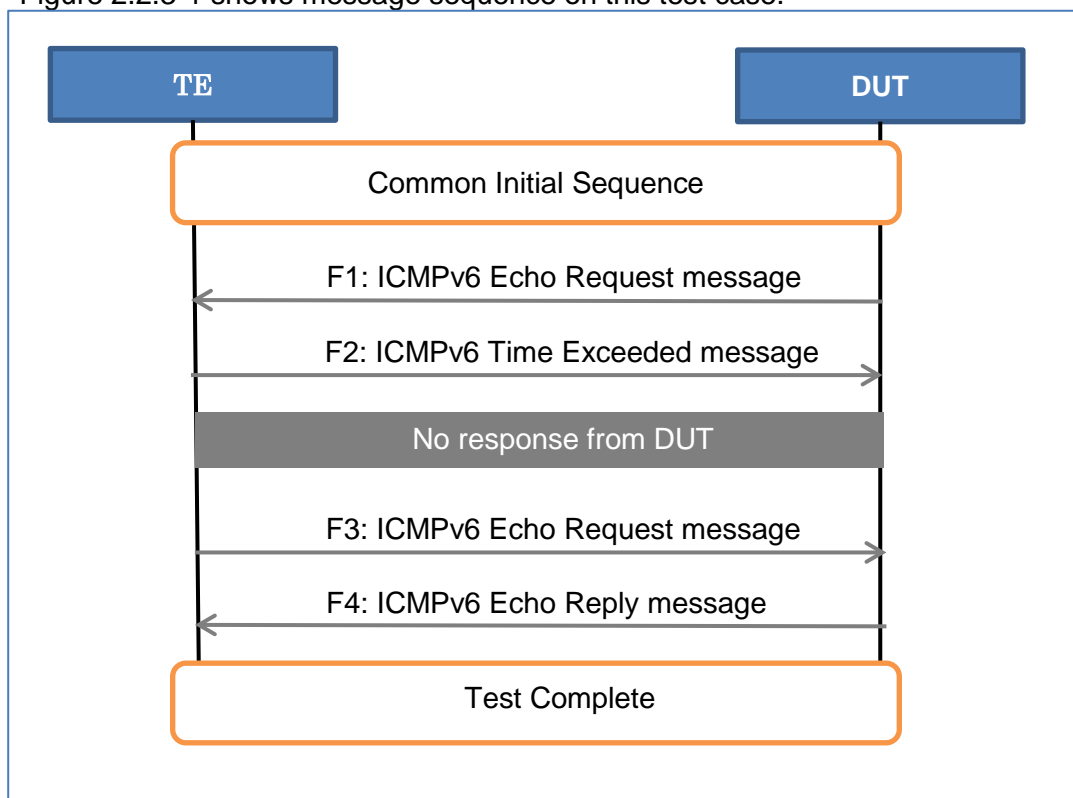


Figure 2.2.3-1 Message Sequence on Reception of ICMPv6 Time Exceeded message

## (3) Packet Definition

Table 2.2.3-1 F1: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | ID                                     | 16            | ID is assigned dynamically by DUT.  |
|                | Sequence            | S                                      | 16            | S is assigned dynamically by DUT  |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| ICMPv6 message | 8000 xxxx xxxx xxxx<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.3-2 F2: ICMPv6 Time Exceeded message

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0058 | 16            |         |

| Layer          | Field               | Value                                  | Length (bits)           | Comment  |
|----------------|---------------------|--|-------------------------|--|
|                | Next header         | 0x3A                                   | 8                       | ICMPv6 (58)  |
|                | Hop limit           | any value                              | 8                       |  |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                     | TE   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128                     | DUT  |
| ICMPv6 message | Type                | 0x03                                   | 8                       | Time Exceeded  |
|                | code                | 0                                      | 8                       | Hop limit exceeded in transit.   |
|                | Checksum            | CCCC                                   | 16                      | 'CCCC' must be calculated correctly.   |
|                | Unused              | 0                                      | 32                      | It must be initialized to zero by the sender and ignore by the receiver.                       |
|                | Data                | ICMPv6 packet defined on F1            | 80 octets * 8bits = 640 | Length of Data shall be as much of F1 as will fit without the ICMPv6 packet exceeding the MTU. |

- Frame Encoding

| Field               | Code (Hex)          |
|---------------------|---------------------|
| IPv6 Header         | 6000 0000 0058 3Axx |
|                     | FE80 0000 0000 0000 |
|                     | C8FE 00FF FE00 0000 |
|                     | FE80 0000 0000 0000 |
|                     | C8FE 00FF FE00 0001 |
| ICMPv6 message      | 0300 xxxx 0000 0000 |
|                     | 6000 0000 0028 3ALL |
|                     | FE80 0000 0000 0000 |
|                     | C8FE 00FF FE00 0001 |
|                     | FE80 0000 0000 0000 |
|                     | C8FE 00FF FE00 0000 |
|                     | 8000 SSSS IIII QQQQ |
|                     | 6162 6364 6566 6768 |
|                     | 696A 6B6C 6D6E 6F70 |
|                     | 7172 7374 7576 7778 |
| 797A 6162 6364 6566 |                     |

Note: 'x' means that these values are variable or allocated dynamically.

'LL' means the value that has set into IPv6 hop limit field of the F1.

'SSSS' means the value that has set into ICMPv6 checksum field of the F1.

'IIII' means the value that has set into ICMPv6 identifier field of the F1.

'QQQQ' means the value that has set into ICMPv6 sequence number field of the F1.

Table 2.2.3-3 F3: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0001                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.3-4 F4: ICMPv6 Echo Reply message

| Layer       | Field          | Value              | Length (bits) | Comment     |
|-------------|----------------|--------------------|---------------|-------------|
| IPv6 Header | Version        | 6                  | 4             |             |
|             | Traffic class  | 0                  | 8             |             |
|             | Flow Label     | 0                  | 20            |             |
|             | Payload length | 0x0028             | 16            |             |
|             | Next header    | 0x3A               | 8             | ICMPv6 (58) |
|             | Hop limit      | any value          | 8             |             |
|             | Source address | 0xFE80000000000000 | 128           | DUT         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                |                     | C8FE00FFFE000001                       |               |                                       |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | 0x0001                                 | 16            | Must be same ID as F3..               |
|                | Sequence            | 0x0001                                 | 16            | Must be same S as F3.                 |
|                | Data                | "abc...xyzabcdef"                      | 256           | Must be same Data as F3.              |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step3    | Confirm that no response is received from DUT.<br>Observe received packet on DUT and confirm it is same as F1.   |
| Step5    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F3) and transmit ICMPv6 Echo Reply message (F4) as the response, without any problem. |

#### 2.2.4. Reception of ICMPv6 Parameter Problem message

This test case verifies that DUT does not originate any response message after receiving ICMPv6 Parameter Problem message against previous ICMPv6 Echo Request message transmitted by DUT.

Further, by running normal sequence of ICMPv6 Echo after that, verifies that DUT has no side effects, and works without any problem..

##### (1) Test Procedure

**STEP1:** Transmit F1 (ICMPv6 Echo Request message) from DUT.

**STEP2:** TE transmits F2 (ICMPv6 Parameter Problem message).

**STEP3:** Confirm that no response from DUT.

**STEP4:** TE transmits F3 (ICMPv6 Echo Request message) destined to DUT.

**STEP5:** Confirm that DUT is able to receive F3 and transmit F4 (ICMPv6 Echo Reply message) as the response, without any side effects and hysteresis from ICMPv6 error message being received previously.

##### (2) Message Sequence

Figure 2.2.4-1 shows message sequence on this test case.

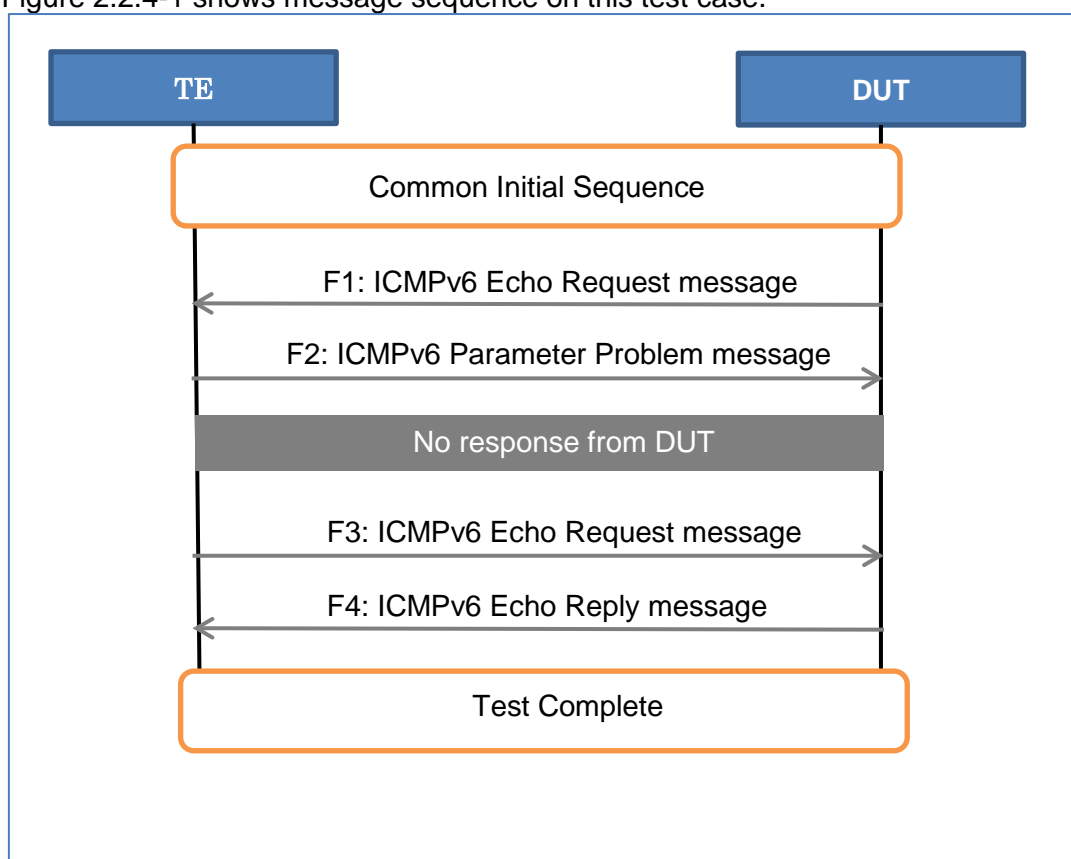


Figure 2.2.4-1 Message Sequence on Reception of ICMPv6 Parameter Problem message



## (3) Packet Definition

Table 2.2.4-1 F1: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | ID                                     | 16            | ID is assigned dynamically by DUT.  |
|                | Sequence            | S                                      | 16            | S is assigned dynamically by DUT  |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

## ● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| ICMPv6 message | 8000 xxxx xxxx xxxx<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.4-2 F2: ICMPv6 Parameter Problem message

| Layer       | Field          | Value  | Length (bits) | Comment |
|-------------|----------------|--------|---------------|---------|
| IPv6 Header | Version        | 6      | 4             |         |
|             | Traffic class  | 0      | 8             |         |
|             | Flow Label     | 0      | 20            |         |
|             | Payload length | 0x0058 | 16            |         |

| Layer          | Field               | Value                                  | Length (bits)                  | Comment   |
|----------------|---------------------|--|--------------------------------|---|
|                | Next header         | 0x3A                                   | 8                              | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8                              |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128                            | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128                            | DUT   |
| ICMPv6 message | Type                | 0x04                                   | 8                              | Parameter Problem   |
|                | code                | 0                                      | 8                              | Erroneous header field encountered  |
|                | Checksum            | CCCC                                   | 16                             | 'CCCC' must be calculated correctly.  |
|                | Pointer             | 0                                      | 32                             | It will point beyond the end of the ICMPv6 packet if the field in error is beyond what can fit in the maximum size of an ICMPv6 error message |
|                | Data                | ICMPv6 packet defined on F1            | 80 octets *<br>8 bits =<br>640 | Length of the Data shall be as much of F1 as will fit without the ICMPv6 packet exceeding the MTU.  |

- Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0058 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
| ICMPv6 message | 0400 xxxx 0000 0000 |
|                | 6000 0000 0028 3ALL |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
|                | 8000 SSSS IIII QQQQ |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

'LL' means the value that has set into IPv6 hop limit field of the F1.

'SSSS' means the value that has set into ICMPv6 checksum field of F1.

'IIII' means the value that has set into ICMPv6 identifier field of F1.

'QQQQ' means the value that has set into ICMPv6 sequence number field of F1.

Table 2.2.4-3 F3: ICMPv6 Echo Request message

| Layer          | Field               | Value                                  | Length (bits) | Comment   |
|----------------|---------------------|--|---------------|---|
| IPv6 Header    | Version             | 6                                      | 4             |   |
|                | Traffic class       | 0                                      | 8             |   |
|                | Flow Label          | 0                                      | 20            |   |
|                | Payload length      | 0x0028                                 | 16            |   |
|                | Next header         | 0x3A                                   | 8             | ICMPv6 (58)   |
|                | Hop limit           | any value                              | 8             |   |
|                | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| ICMPv6 message | Type                | 0x80                                   | 8             | Echo Request (128)  |
|                | code                | 0                                      | 8             |   |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
|                | Identifier          | 0x0001                                 | 16            |   |
|                | Sequence            | 0x0001                                 | 16            |   |
|                | Data                | "abc...xyzabcdef"                      | 256           | 32 bytes of a cyclic string that consists of lower case alphabetical letter |

● Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 0028 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| ICMPv6 message | 8000 xxxx 0001 0001<br>6162 6364 6566 6768<br>696A 6B6C 6D6E 6F70<br>7172 7374 7576 7778<br>797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.2.4-4 F4: ICMPv6 Echo Reply message

| Layer       | Field          | Value              | Length (bits) | Comment     |
|-------------|----------------|--------------------|---------------|-------------|
| IPv6 Header | Version        | 6                  | 4             |             |
|             | Traffic class  | 0                  | 8             |             |
|             | Flow Label     | 0                  | 20            |             |
|             | Payload length | 0x0028             | 16            |             |
|             | Next header    | 0x3A               | 8             | ICMPv6 (58) |
|             | Hop limit      | any value          | 8             |             |
|             | Source address | 0xFE80000000000000 | 128           | DUT         |

| Layer          | Field               | Value                                  | Length (bits) | Comment                               |
|----------------|---------------------|--|---------------|---------------------------------------|
|                |                     | C8FE00FFFE000001                       |               |                                       |
|                | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE                                    |
| ICMPv6 message | Type                | 0x81                                   | 8             | Echo Reply (129)                      |
|                | code                | 0                                      | 8             |                                       |
|                | Checksum            | CCCC                                   | 16            | 'CCCC' shall be calculated correctly. |
|                | Identifier          | 0x0001                                 | 16            | Must be same ID as F3..               |
|                | Sequence            | 0x0001                                 | 16            | Must be same S as F3.                 |
|                | Data                | "abc...xyzabcdef"                      | 256           | Must be same Data as F3.              |

● Frame Encoding

| Field          | Code (Hex)          |
|----------------|---------------------|
| IPv6 Header    | 6000 0000 0028 3Axx |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0001 |
|                | FE80 0000 0000 0000 |
|                | C8FE 00FF FE00 0000 |
| ICMPv6 message | 8100 xxxx 0001 0001 |
|                | 6162 6364 6566 6768 |
|                | 696A 6B6C 6D6E 6F70 |
|                | 7172 7374 7576 7778 |
|                | 797A 6162 6364 6566 |

Note: 'x' means that these values are variable or allocated dynamically.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step3    | Confirm that no response is received from DUT.<br>Observe received packet on DUT and confirm it is same as F1.   |
| Step5    | Confirm that DUT is able to receive ICMPv6 Echo Request message (F3) and transmit ICMPv6 Echo Reply message (F4) as the response, without any problem. |

### 2.3. Transmission of ICMPv6 Error Messages

This test case verifies that DUT issues relevant ICMPv6 error message when abnormal condition has been found on the communication.

#### 2.3.1. Transmission of ICMPv6 Parameter Problem message

This test case verifies that DUT is able to generate and transmit ICMPv6 Parameter Problem message when IPv6 packet which has wrong optional header is received.

(1) Test Procedure

**STEP1:** Transmit F1 (IPv6 packet with wrong next header value) from TE.

**STEP2:** Confirm if DUT transmits F2 (ICMPv6 Parameter Problem message).

(2) Message Sequence

Figure 2.3.1-1 shows message sequence on this test case.

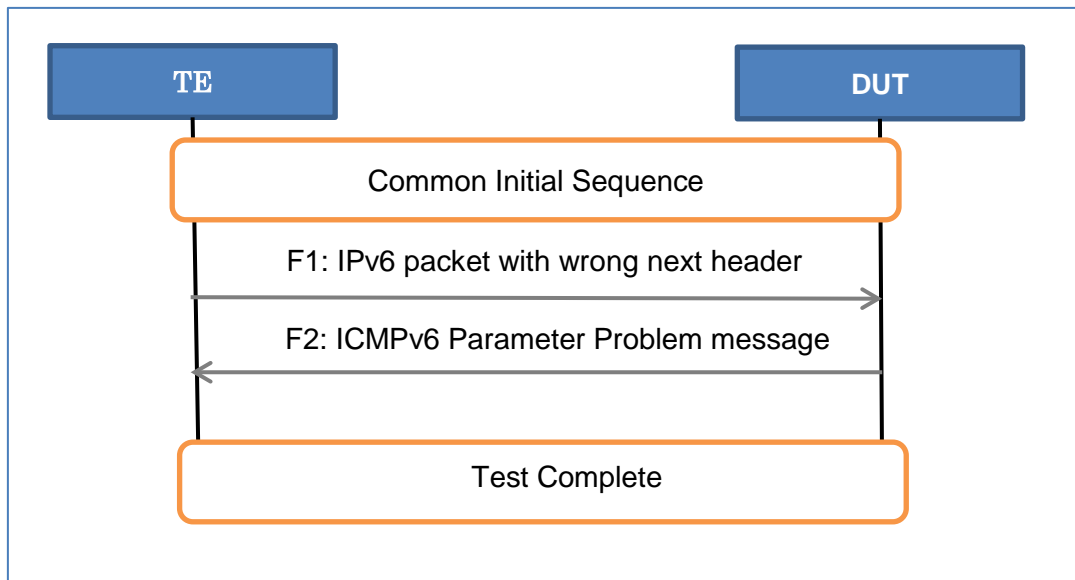


Figure 2.3.1-1 Message Sequence on Transmission of ICMPv6 Parameter Problem

## (3) Packet Definition

Table 2.3.1-1 F1: IPv6 packet with wrong optional header

| Layer        | Field               | Value                                  | Length (bits) | Comment        |
|--------------|---------------------|--|---------------|----------------|
| IPv6 Header  | Version             | 6                                      | 4             |                |
|              | Traffic class       | 0                                      | 8             |                |
|              | Flow Label          | 0                                      | 20            |                |
|              | Payload length      | 0x0020                                 | 16            |                |
|              | Next header         | 0xFE                                   | 8             | Reserved value |
|              | Hop limit           | any value                              | 8             |                |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE             |
|              | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT            |
| IPv6 Payload | Data                | 32 octets of 0xFF                      | 256           |                |

## ● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0020 FE <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| IPv6 Payload | FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF                                |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.3.1-2 F2: ICMPv6 Parameter Problem message

| Layer       | Field          | Value                                  | Length (bits) | Comment   |
|-------------|----------------|--|---------------|---|
| IPv6 Header | Version        | 6                                      | 4             |   |
|             | Traffic class  | 0                                      | 8             |   |
|             | Flow Label     | 0                                      | 20            |   |
|             | Payload length | Max: 0x0050<br>Min: 0x000F             | 16            | This value is variable between Max and Min due to how many octets are put into the data field of this ICMPv6 Parameter Problem message. |
|             | Next header    | 0x3A                                   | 8             | ICMPv6 (58)   |
|             | Hop limit      | any value                              | 8             |   |
|             | Source address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|             | Destination    | 0xFE80000000000000                     | 128           | TE  |

| Layer          | Field    | Value   | Length (bits)   | Comment  |
|----------------|----------|---|---|--|
|                | address  | C8FE00FFFE000000                              |   |  |
| ICMPv6 message | Type     | 0x04  | 8   | Parameter Problem  |
|                | code     | 1   | 8   | unrecognized Next Header type encountered  |
|                | Checksum | CCCC  | 16  | 'CCCC' must be calculated correctly.   |
|                | Pointer  | 6   | 32  | This identifies the octet offset within the invoking packet where the error was detected. In this case, this value shall be "6" that indicates next header field in IPv6 header of the invoking packet.                                      |
|                | Data     | Whole or portion of IPv6 packet defined on F1 | Maximum length is 72 octets * 8 bits = 576<br>Minimum length is 7 octets * 8 bits = 56. | Maximum length of this data shall be as much of F1 as will fit without the IPv6 packet exceeding the MTU.<br>This data must also include octet string from the beginning of F1 to the octet position where the error was detected, at least. |

- Frame Encoding

| Field          | Code (Hex)   |
|----------------|--|
| IPv6 Header    | 6000 0000 LLLL 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000  |
| ICMPv6 message | 0401 xxxx 0000 0000<br>6000 0000 0020 FEHH<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF<br>FFFF FFFF FFFF FFFF |

Note: 'x' means that these values are variable or allocated dynamically.

'LLLL' means that this value is variable due to the number of octets that are put into the payload

'HH' means the value that has set into IPv6 hop limit field of the F1.

Regarding the ICMPv6 message specified in this table, first 7 octets must be confirmed and other data following them shall not need to be verified even though existing.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts  |
|----------|---|
| Step2    | Confirm if DUT have transmitted ICMPv6 Parameter Problem message specified in Table 2.3.1-2 to TE.. |

#### 2.4. UDP transmission and reception

This section defines the test cases regarding transmission and reception of UDP packet on unicast, and multicast as well. These test cases verify that:

- (1) DUT is able to transmit and receive UDP packet destined to DUT's unicast IPv6 address.
- (2) DUT is able to transmit and receive UDP packet destined to all nodes group multicast address.



2.4.1. Reception of Unicast UDP packet

This test case verifies that DUT can receive unicast UDP packet and analyze it correctly, and generates unicast UDP packet and send it, as well.

(1) Test Procedure

- STEP1:** Transmit F1 (unicast UDP packet contained ECHONET Lite GET) from TE to DUT.
- STEP2:** Confirm if DUT transmits F2 (unicast UDP packet contained ECHONET Lite GET\_RES) to TE, as response to F1.

(2) Message Sequence

Figure 2.4.1-1 shows message sequence on this test case.

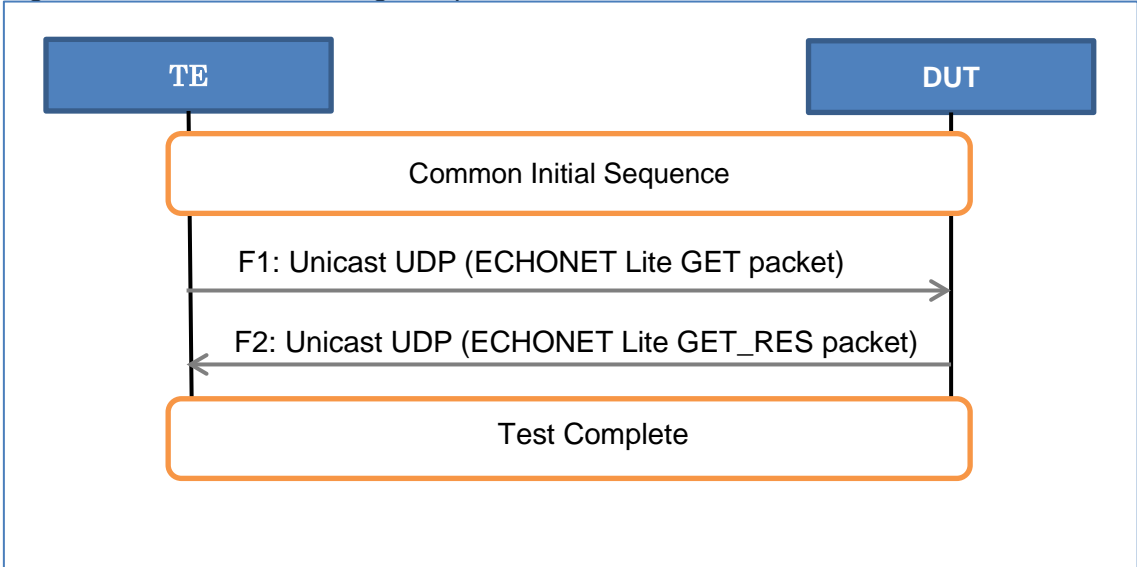


Figure 2.4.1-1 Message sequence on Reception of Unicast UDP packet

**(3) Packet Definition**

Each packets used in this test case are defined in the tables below. IPv6 Interface Identifier part in each address shall be generated from PAN ID and short address assigned to the node (TE or DUT), except multicast group address.

Table 2.4.1-1 F1: Unicast UDP packet (ECHONET Lite GET) from TE

| Layer               | Field                                  | Value                                  | Length (bits) | Comment  |
|---------------------|--|--|---------------|--|
| IPv6 Header         | Version                                | 6                                      | 4             |  |
|                     | Traffic class                          | 0                                      | 8             |  |
|                     | Flow Label                             | 0                                      | 20            |  |
|                     | Payload length                         | 0x0016                                 | 16            |  |
|                     | Next header                            | 0x11                                   | 8             | UDP (17)   |
|                     | Hop limit                              | any value                              | 8             |  |
|                     | Source address                         | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE   |
| Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128                                    | DUT           |  |
| UDP Header          | Source port                            | 3610                                   | 16            |  |
|                     | Destination port                       | 3610                                   | 16            |  |
|                     | Length                                 | 0x0016                                 | 16            | .Length of the UDP datagram consist of UDP header and data part. |
|                     | Checksum                               | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                             |
| ECHONET Lite        | EHD1                                   | 0x10                                   | 8             | Protocol type  |
|                     | EHD2                                   | 0x81                                   | 8             | Message type   |
|                     | TID                                    | 0x1234                                 | 16            | Transaction ID   |
|                     | SEOJ                                   | 0x0EF001                               | 24            | Source object  |
|                     | DEOJ                                   | 0x0EF001                               | 24            | Destination object   |
|                     | ESV                                    | 0x62                                   | 8             | ECHONET Lite GET   |
|                     | OPC                                    | 1                                      | 8             | Number of property   |
|                     | EPC                                    | 0x80                                   | 8             | ECHONET Lite property  |
|                     | PDC                                    | 0                                      | 8             | Length of EDT  |
| EDT                 | None                                   | -                                      |               |  |

## ● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0016 11xx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| UDP Header   | 0E1A 0E1A 0016 xxxx   |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 6201 8000   |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.4.1-2 F2: Unicast UDP packet (ECHONET Lite GET\_RES) from DUT

| Layer        | Field               | Value                                  | Length (bits) | Comment   |
|--------------|---------------------|--|---------------|---|
| IPv6 Header  | Version             | 6                                      | 4             |   |
|              | Traffic class       | 0                                      | 8             |   |
|              | Flow Label          | 0                                      | 20            |   |
|              | Payload length      | 0x0017                                 | 16            |   |
|              | Next header         | 0x11                                   | 8             | UDP (17)  |
|              | Hop limit           | any value                              | 8             |   |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|              | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| UDP Header   | Source port         | arbitrary                              | 16            |   |
|              | Destination port    | 3610                                   | 16            |   |
|              | Length              | 0x0017                                 | 16            | .L is length of the UDP datagram consist of UDP header and data part.                                   |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type   |
|              | EHD2                | 0x81                                   | 8             | Message type  |
|              | TID                 | 0x1234                                 | 16            | Transaction ID  |
|              | SEOJ                | 0x0EF001                               | 24            | Source object   |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object  |
|              | ESV                 | 0x72                                   | 8             | ECHONET Lite GET_RES  |
|              | OPC                 | 1                                      | 8             | Number of property  |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property   |
|              | PDC                 | 1                                      | 8             | Length of EDT   |
|              | EDT                 | 0x30 or 0x31                           | 8             | This value alters depending on operating state of controlled apparatus which has equipped into the DUT. |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0017 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| UDP Header   | 0E1A 0E1A 0017 <b>xxxx</b>  |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 7201 8001 VV  |

Note: 'x' means that these values are variable or allocated dynamically.

'VV' shall be either of 0x30 or 0x31.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts  |
|----------|---|
| Step2    | TE must receive unicast UDP packet (F2) from DUT. |

2.4.2. Transmission of Unicast UDP packet

This test case verifies that DUT can generate proper unicast UDP packet and send it.

(1) Test Procedure

**STEP1:** Get DUT to transmit F1 (unicast UDP packet contained ECHONET Lite GET) to TE.

**STEP2:** TE transmits F2 (unicast UDP packet contained ECHONET Lite GET\_RES) to DUT, as the response to F1.

(2) Message Sequence

Figure 2.4.2-1 shows message sequence on this test case.

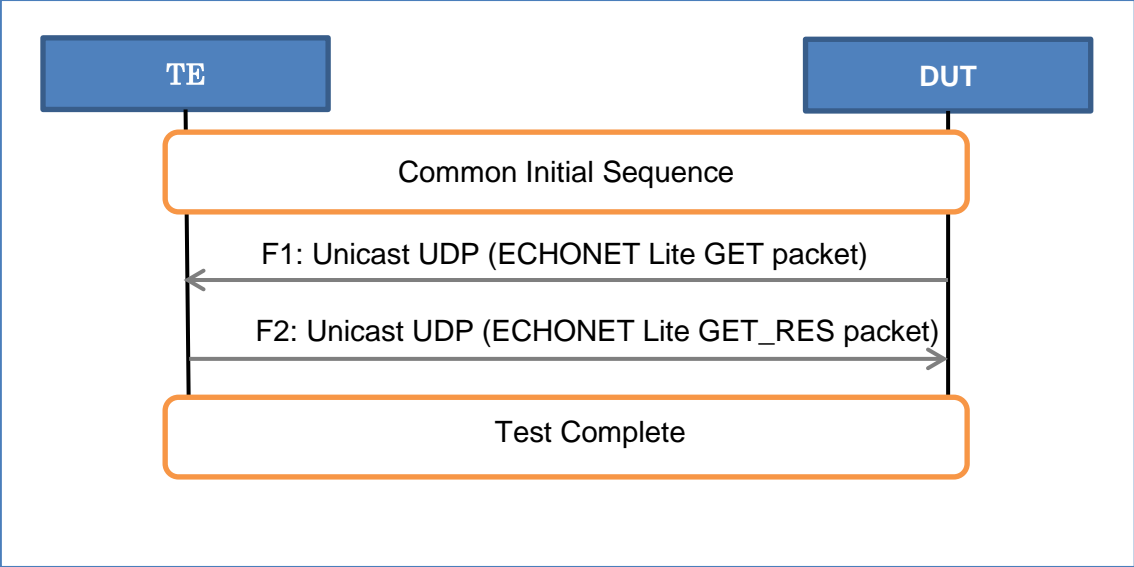


Figure 2.4.2-1 Message sequence on Transmission of Unicast UDP packet

(3) Packet Definition

Table 2.4.2-1 F1: Unicast UDP packet (ECHONET Lite GET) from DUT.

| Layer        | Field               | Value                                  | Length (bits) | Comment   |
|--------------|---------------------|--|---------------|---|
| IPv6 Header  | Version             | 6                                      | 4             |   |
|              | Traffic class       | 0                                      | 8             |   |
|              | Flow Label          | 0                                      | 20            |   |
|              | Payload length      | 0x0016                                 | 16            |   |
|              | Next header         | 0x11                                   | 8             | UDP (17)  |
|              | Hop limit           | any value                              | 8             |   |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
|              | Destination address | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
| UDP Header   | Source port         | arbitrary                              | 16            |   |
|              | Destination port    | 3610                                   | 16            |   |
|              | Length              | 0x0016                                 | 16            | length of the UDP datagram consist of UDP header and data part. |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                            |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type   |
|              | EHD2                | 0x81                                   | 8             | Message type  |
|              | TID                 | any value                              | 16            | Transaction ID  |
|              | SEOJ                | 0x0EF001                               | 24            | Source object   |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object  |
|              | ESV                 | 0x62                                   | 8             | ECHONET Lite GET  |
|              | OPC                 | 1                                      | 8             | Number of property  |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property   |
|              | PDC                 | 0                                      | 8             | Length of EDT   |
| EDT          | None                | -                                      |               |   |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0016 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000 |
| UDP Header   | <b>xxxx</b> 0E1A 0016 <b>xxxx</b>   |
| ECHONET Lite | 1081 <b>xxxx</b> 0EF0 010E<br>F001 6201 8000  |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.4.2-2 F2: Unicast UDP packet (ECHONET Lite GET\_RES) from TE

| Layer        | Field               | Value                                  | Length (bits) | Comment  |
|--------------|---------------------|--|---------------|--|
| IPv6 Header  | Version             | 6                                      | 4             |  |
|              | Traffic class       | 0                                      | 8             |  |
|              | Flow Label          | 0                                      | 20            |  |
|              | Payload length      | 0x0017                                 | 16            |  |
|              | Next header         | 0x11                                   | 8             | UDP (17)   |
|              | Hop limit           | any value                              | 8             |  |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE   |
|              | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT  |
| UDP Header   | Source port         | 3610                                   | 16            |  |
|              | Destination port    | 3610                                   | 16            | Same number as source port in F1.                                  |
|              | Length              | 0x0017                                 | 16            | length of the UDP datagram consist of UDP header and data part.    |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                               |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type  |
|              | EHD2                | 0x81                                   | 8             | Message type   |
|              | TID                 | Same value as TID of F1                | 16            | Transaction ID<br>TE needs to extract this value from F1 received. |
|              | SEOJ                | 0x0EF001                               | 24            | Source object  |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object   |
|              | ESV                 | 0x72                                   | 8             | ECHONET Lite GET_RES   |
|              | OPC                 | 1                                      | 8             | Number of property   |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property  |
|              | PDC                 | 1                                      | 8             | Length of EDT  |
| EDT          | 0x30 or 0x31        | 8                                      |               |  |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0017 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| UDP Header   | 0E1A <b>PPPP</b> 0017 <b>xxxx</b>   |
| ECHONET Lite | 1081 <b>TTTT</b> 0EF0 010E<br>F001 7201 8001 <b>vv</b>  |

Note: 'x' means that these values are variable or allocated dynamically.  
 'PPPP' shall be same as source port number in the F1.  
 'TTTT' shall be same as TID value in the F1.  
 'vv' shall be either of 0x30 or 0x31.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts  |
|----------|---|
| Step1    | TE must receive unicast UDP packet (F1) from DUT. |

2.4.3. Filtering of unicast UDP packet destined to the other

This test case verifies that DUT does not respond to any packet destined to the other node.

**(1) Test Procedure**

- STEP1:** Transmit F1 (unicast UDP packet) from TE to the other destination than DUT.
- STEP2:** Confirm that no response from DUT to F1.

**(2) Message Sequence**

Figure 2.4.3-1 shows message sequence on this test case.

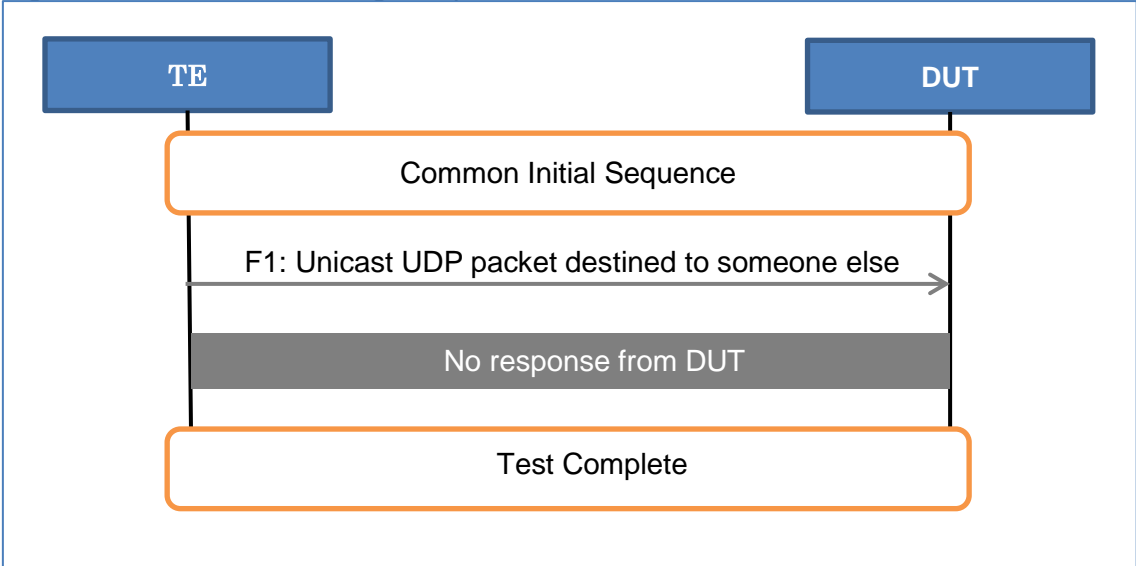


Figure 2.4.3-1 Message sequence on Filtering of unicast UDP packet destined to the other

**(3) Packet Definition**

Table 2.4.3-1 F1: Unicast UDP packet destined to someone else from TE.

| Layer         | Field               | Value                                  | Length (bits) | Comment  |
|---------------|---------------------|--|---------------|--|
| IPv6 Header   | Version             | 6                                      | 4             |  |
|               | Traffic class       | 0                                      | 8             |  |
|               | Flow Label          | 0                                      | 20            |  |
|               | Payload length      | 0x0016                                 | 16            |  |
|               | Next header         | 0x11                                   | 8             | UDP (17)   |
|               | Hop limit           | any value                              | 8             |  |
|               | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE   |
|               | Destination address | 0xFE80000000000000<br>C8FE00FFFE0000AA | 128           | other destination address than TE and DUT                        |
| UDP Header    | Source port         | 3610                                   | 16            |  |
|               | Destination port    | 3610                                   | 16            |  |
|               | Length              | 0x0016                                 | 16            | .Length of the UDP datagram consist of UDP header and data part. |
|               | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                             |
| ECHONE T Lite | EHD1                | 0x10                                   | 8             | Protocol type  |
|               | EHD2                | 0x81                                   | 8             | Message type   |
|               | TID                 | 0x1234                                 | 16            | Transaction ID   |
|               | SEOJ                | 0x0EF001                               | 24            | Source object  |
|               | DEOJ                | 0x0EF001                               | 24            | Destination object   |
|               | ESV                 | 0x62                                   | 8             | ECHONET Lite GET   |
|               | OPC                 | 1                                      | 8             | Number of property   |
|               | EPC                 | 0x80                                   | 8             | ECHONET Lite property  |
|               | PDC                 | 0                                      | 8             | Length of EDT  |
|               | EDT                 | None                                   | -             |  |

## ● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0016 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 00AA |
| UDP Header   | <b>0E1A</b> 0E1A 0016 <b>xxxx</b>   |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 6201 8000   |

Note: 'x' means that these values are variable or allocated dynamically.



**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts                           |
|----------|------------------------------------|
| Step2    | No response must receive from DUT. |

**Reception of Multicast UDP packet**

This test case verifies that DUT is able to send and receive multicast UDP packet. In this test case, "INF\_REQ" and "INF" are used as test data contained in the body of UDP packet.

**(1) Test Procedure**

- STEP1:** Transmit F1 (multicast UDP packet contained ECHONET Lite INF\_REQ) from TE to DUT.
- STEP2:** Confirm if DUT transmits F2 (multicast UDP packet contained ECHONET Lite INF) to TE as the response to F1.

**(2) Message Sequence**

Figure 2.4.4-1 shows message sequence on this test case.

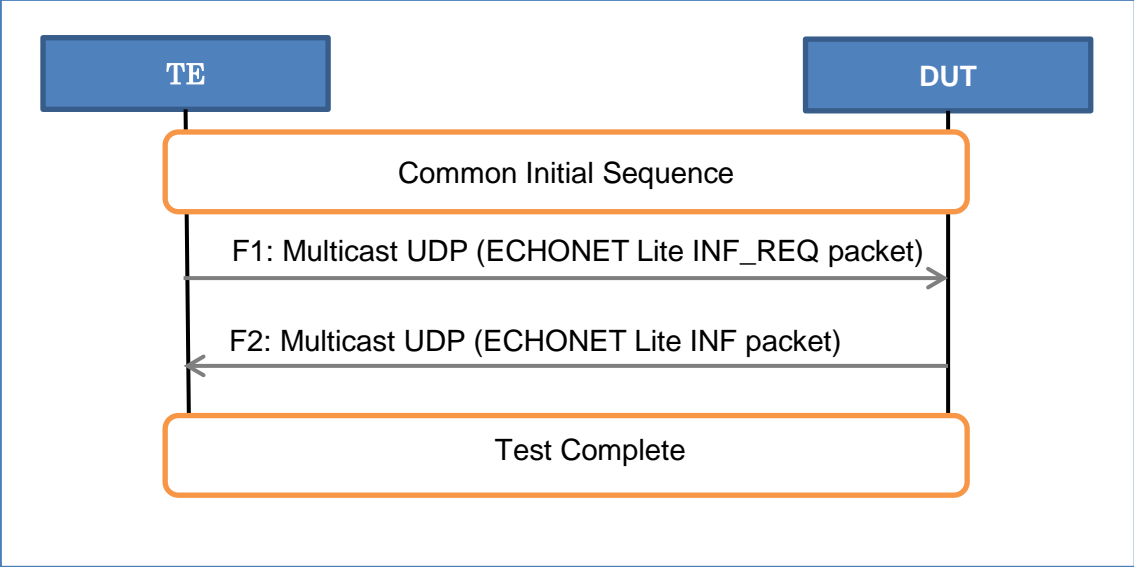


Figure 2.4.4-2 Message sequence on Reception of Multicast UDP packet

(3) Packet Definition

Table 2.4.4-2 F1: Multicast UDP packet (ECHONET Lite INF\_REQ) from TE.

| Layer        | Field               | Value                                  | Length (bits) | Comment  |
|--------------|---------------------|--|---------------|--|
| IPv6 Header  | Version             | 6                                      | 4             |  |
|              | Traffic class       | 0                                      | 8             |  |
|              | Flow Label          | 0                                      | 20            |  |
|              | Payload length      | 0x0016                                 | 16            |  |
|              | Next header         | 0x11                                   | 8             | UDP (17)   |
|              | Hop limit           | any value                              | 8             |  |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE   |
|              | Destination address | <b>FF02::1</b>                         | 128           | All nodes group address  |
| UDP Header   | Source port         | 3610                                   | 16            |  |
|              | Destination port    | 3610                                   | 16            |  |
|              | Length              | 0x0016                                 | 16            | .Length of the UDP datagram consist of UDP header and data part. |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                             |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type  |
|              | EHD2                | 0x81                                   | 8             | Message type   |
|              | TID                 | 0x1234                                 | 16            | Transaction ID   |
|              | SEOJ                | 0x0EF001                               | 24            | Source object  |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object   |
|              | ESV                 | 0x63                                   | 8             | ECHONET Lite INF_REQ   |
|              | OPC                 | 1                                      | 8             | Number of property   |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property  |
|              | PDC                 | 0                                      | 8             | Length of EDT  |
|              | EDT                 | None                                   | -             |  |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0016 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FF02 0000 0000 0000<br>0000 0000 0000 0001 |
| UDP Header   | <b>0E1A</b> 0E1A 0016 <b>xxxx</b>   |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 6301 8000   |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.4.4-3 F2: Multicast UDP packet (ECHONET Lite INF) from DUT

| Layer | Field | Value | Length (bits) | Comment |
|-------|-------|-------|---------------|---------|
|-------|-------|-------|---------------|---------|

| Layer        | Field               | Value                                       | Length (bits) | Comment   |
|--------------|---------------------|---|---------------|---|
| IPv6 Header  | Version             | 6   | 4             |   |
|              | Traffic class       | 0   | 8             |   |
|              | Flow Label          | 0   | 20            |   |
|              | Payload length      | 0x0017                                      | 16            |   |
|              | Next header         | 0x11  | 8             | UDP (17)  |
|              | Hop limit           | any value                                   | 8             |   |
|              | Source address      | 0xFE80000000000000<br>0<br>C8FE00FFFE000001 | 128           | DUT   |
|              | Destination address | <b>FF02::1</b>                              | 128           | All nodes group address   |
| UDP Header   | Source port         | arbitrary                                   | 16            |   |
|              | Destination port    | 3610  | 16            |   |
|              | Length              | 0x0017                                      | 16            | length of the UDP datagram consist of UDP header and data part.   |
|              | Checksum            | CCCC  | 16            | 'CCCC' must be calculated correctly.  |
| ECHONET Lite | EHD1                | 0x10  | 8             | Protocol type   |
|              | EHD2                | 0x81  | 8             | Message type  |
|              | TID                 | 0x1234                                      | 16            | Transaction ID  |
|              | SEOJ                | 0x0EF001                                    | 24            | Source object   |
|              | DEOJ                | 0x0EF001                                    | 24            | Destination object  |
|              | ESV                 | 0x73  | 8             | ECHONET Lite INF  |
|              | OPC                 | 1   | 8             | Number of property  |
|              | EPC                 | 0x80  | 8             | ECHONET Lite property   |
|              | PDC                 | 1   | 8             | Length of EDT   |
|              | EDT                 | 0x30 or 0x31                                | 8             | This value alters depending on operating state of controlled apparatus which has equipped into the DUT. |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0017 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FF02 0000 0000 0000<br>0000 0000 0000 0001 |
| UDP Header   | <b>0E1A</b> 0E1A 0017 <b>xxxx</b>   |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 7301 8000 <b>VV</b>   |

Note: 'x' means that these values are variable or allocated dynamically.

'PPPP' shall be same as source port number used in the F1.

'VV' shall be either of 0x30 or 0x31.

**(4) Expected Result**

Following expected results shall be verified on this test case.

| Criteria | Verdicts  |
|----------|---|
| Step2    | TE must receive multicast UDP packet (F1) from DUT. |

**2.4.4. Transmission of Multicast UDP packet**

This test case verifies that DUT is able to send and receive multicast UDP packet. In this test case, "INF\_REQ" and "INF" are used as test data contained in the body of UDP packet

**(1) Test Procedure**

- STEP1:** Transmit F1 (multicast UDP packet contained ECHONET Lite INF\_REQ) from DUT to TE
- STEP2:** Confirm that TE have received F1 from UDP, and then TE transmits F2 (multicast UDP packet contained ECHONET Lite INF) to DUT, as the response to F1.

**(2) Message Sequence**

Figure 2.4.5-1 shows message sequence on this test case.

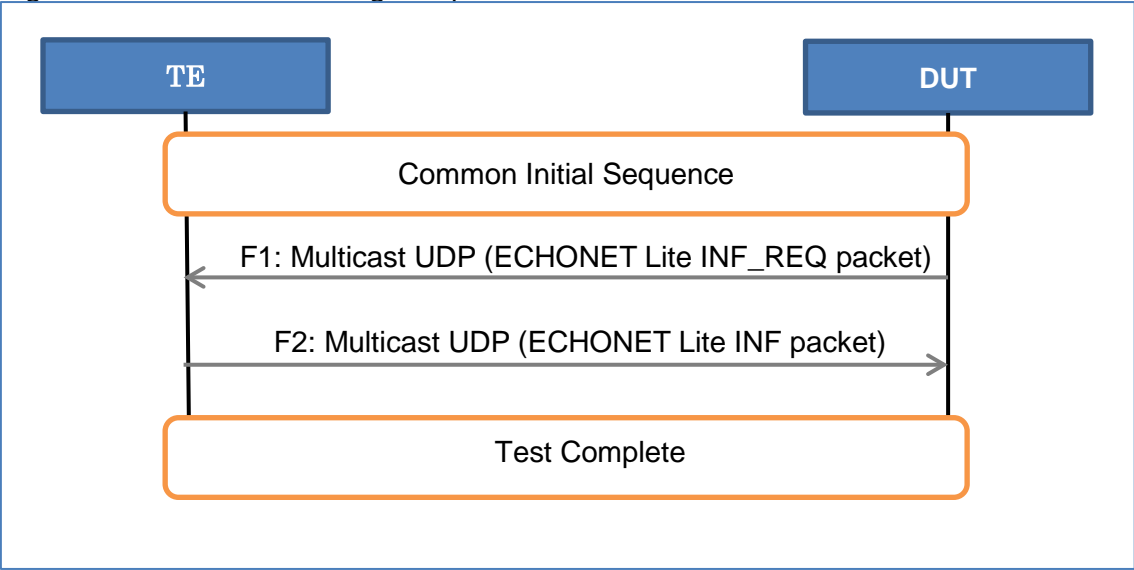


Figure 2.4.5-1 Message sequence on Reception of Multicast UDP packet

(3) Packet Definition

Table 2.4.5-1 F1: Multicast UDP packet (ECHONET Lite INF\_REQ) from DUT

| Layer        | Field               | Value                                  | Length (bits) | Comment  |
|--------------|---------------------|--|---------------|--|
| IPv6 Header  | Version             | 6                                      | 4             |  |
|              | Traffic class       | 0                                      | 8             |  |
|              | Flow Label          | 0                                      | 20            |  |
|              | Payload length      | 0x0016                                 | 16            |  |
|              | Next header         | 0x11                                   | 8             | UDP (17)   |
|              | Hop limit           | any value                              | 8             |  |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT  |
|              | Destination address | <b>FF02::1</b>                         | 128           |  |
| UDP Header   | Source port         | arbitrary                              | 16            |  |
|              | Destination port    | 3610                                   | 16            |  |
|              | Length              | 0x0016                                 | 16            | .Length of the UDP datagram consist of UDP header and data part. |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                             |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type  |
|              | EHD2                | 0x81                                   | 8             | Message type   |
|              | TID                 | any value                              | 16            | Transaction ID   |
|              | SEOJ                | 0x0EF001                               | 24            | Source object  |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object   |
|              | ESV                 | 0x63                                   | 8             | ECHONET Lite INF_REQ   |
|              | OPC                 | 1                                      | 8             | Number of property   |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property  |
|              | PDC                 | 0                                      | 8             | Length of EDT  |
|              | EDT                 | None                                   | -             | No ECHONET Lite Data   |

● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0016 11xx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FF02 0000 0000 0000<br>0000 0000 0000 0001 |
| UDP Header   | xxxx 0E1A 0016 xxxx   |
| ECHONET Lite | 1081 xxxx 0EF0 010E<br>F001 6301 8000   |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.4.5-2 F2: Multicast UDP packet (ECHONET Lite INF) from TE

| Layer        | Field               | Value                                  | Length (bits) | Comment   |
|--------------|---------------------|--|---------------|---|
| IPv6 Header  | Version             | 6                                      | 4             |   |
|              | Traffic class       | 0                                      | 8             |   |
|              | Flow Label          | 0                                      | 20            |   |
|              | Payload length      | 0x0017                                 | 16            |   |
|              | Next header         | 0x11                                   | 8             | UDP (17)  |
|              | Hop limit           | any value                              | 8             |   |
|              | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|              | Destination address | <b>FF02::1</b>                         | 128           |   |
| UDP Header   | Source port         | 3610                                   | 16            |   |
|              | Destination port    | 3610                                   | 16            |   |
|              | Length              | 0x0017                                 | 16            | length of the UDP datagram consist of UDP header and data part.   |
|              | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.  |
| ECHONET Lite | EHD1                | 0x10                                   | 8             | Protocol type   |
|              | EHD2                | 0x81                                   | 8             | Message type  |
|              | TID                 | 0x1234                                 | 16            | Transaction ID  |
|              | SEOJ                | 0x0EF001                               | 24            | Source object   |
|              | DEOJ                | 0x0EF001                               | 24            | Destination object  |
|              | ESV                 | 0x73                                   | 8             | ECHONET Lite INF  |
|              | OPC                 | 1                                      | 8             | Number of property  |
|              | EPC                 | 0x80                                   | 8             | ECHONET Lite property   |
|              | PDC                 | 1                                      | 8             | Length of EDT   |
|              | EDT                 | 0x30 or 0x31                           | 8             | This value alters depending on operating state of controlled apparatus which has equipped into the DUT. |

- Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 0017 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FF02 0000 0000 0000<br>0000 0000 0000 0001 |
| UDP Header   | 0E1A PPPP 0017 <b>xxxx</b>  |
| ECHONET Lite | 1081 1234 0EF0 010E<br>F001 7301 8001 vv  |

Note: 'x' means that these values are variable or allocated dynamically.

'PPPP' shall be same as source port number used in the F1.

'vv' shall be either of 0x30 or 0x31.

(4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts  |
|----------|---|
| Step1    | TE must receive multicast UDP packet (F1) from DUT. |

2.4.5. Unicast UDP arrived on unavailable port number

This test case verifies if DUT can respond with ICMPv6 Port Unreachable message when unicast UDP packet destined to unavailable port number on the DUT is received.

(1) Test Procedure

**STEP1:** Transmit F1 (unicast UDP packet destined to unavailable port number on the DUT) from TE to DUT.

**STEP2:** Confirm that DUT respond with F2 (ICMPv6 Port Unreachable message) in order to indicate that specified port number is unavailable on the DUT.

(2) Message Sequence

Figure 2.4.6-1 shows message sequence on this test case.

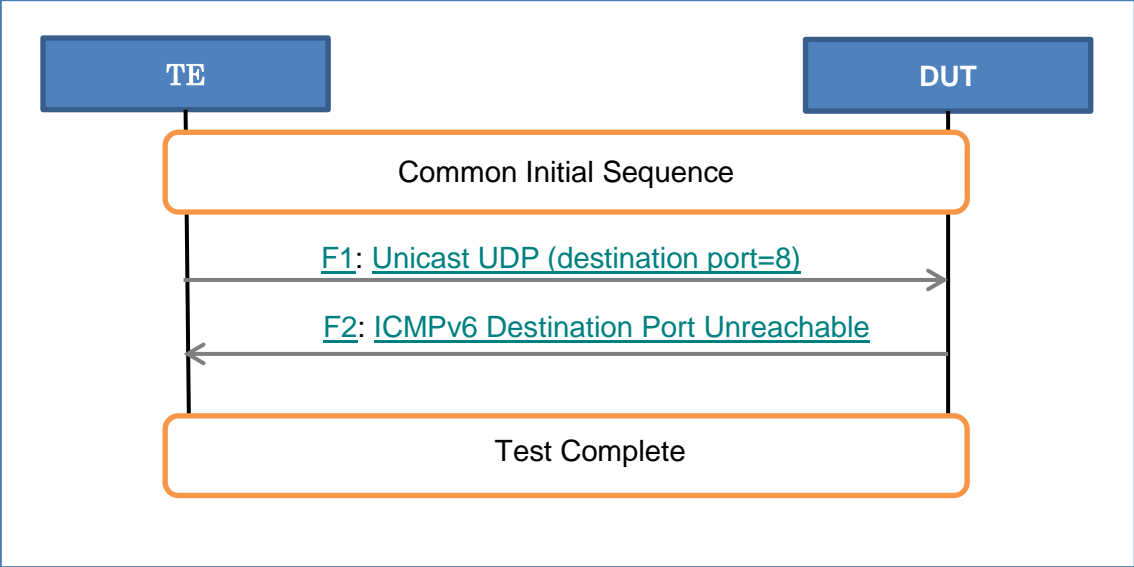


Figure 2.4.6-1 Message sequence on Unicast UDP arrived on unavailable port number

## (3) Packet Definition

Table 2.4.6-1 F1: Unicast UDP packet (destination port = 8)

| Layer       | Field               | Value                                  | Length (bits) | Comment   |
|-------------|---------------------|--|---------------|---|
| IPv6 Header | Version             | 6                                      | 4             |   |
|             | Traffic class       | 0                                      | 8             |   |
|             | Flow Label          | 0                                      | 20            |   |
|             | Payload length      | 0x000A                                 | 16            |   |
|             | Next header         | 0x11                                   | 8             | UDP (17)  |
|             | Hop limit           | any value                              | 8             |   |
|             | Source address      | 0xFE80000000000000<br>C8FE00FFFE000000 | 128           | TE  |
|             | Destination address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT   |
| UDP Header  | Source port         | 8                                      | 16            |   |
|             | Destination port    | 8                                      | 16            |   |
|             | Length              | 0x000A                                 | 16            | Length of the UDP datagram consist of UDP header and data part. |
|             | Checksum            | CCCC                                   | 16            | 'CCCC' must be calculated correctly.                            |
| UDP payload | Data                | 0x0000                                 | 16            |   |

## ● Frame Encoding

| Field        | Code (Hex)  |
|--------------|---|
| IPv6 Header  | 6000 0000 000A 11 <b>xx</b><br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001 |
| UDP Header   | 0008 0008 000A <b>xxxx</b>  |
| UDP datagram | 0000  |

Note: 'x' means that these values are variable or allocated dynamically.

Table 2.4.6-2 F2: ICMPv6 Port Unreachable message from DUT

| Layer       | Field          | Value                                  | Length (bits) | Comment     |
|-------------|----------------|--|---------------|-------------|
| IPv6 Header | Version        | 6                                      | 4             |             |
|             | Traffic class  | 0                                      | 8             |             |
|             | Flow Label     | 0                                      | 20            |             |
|             | Payload length | 0x3A                                   | 16            |             |
|             | Next header    | 0x3A                                   | 8             | ICMPv6 (58) |
|             | Hop limit      | any value                              | 8             |             |
|             | Source address | 0xFE80000000000000<br>C8FE00FFFE000001 | 128           | DUT         |
|             | Destination    | 0xFE80000000000000                     | 128           | TE          |



| Layer          | Field    | Value                       | Length (bits)           | Comment   |
|----------------|----------|-----------------------------|-------------------------|---|
|                | address  | C8FE00FFFE000000            |                         |   |
| ICMPv6 message | Type     | 0x01                        | 8                       | Destination Unreachable   |
|                | code     | 4                           | 8                       | Address Unreachable   |
|                | Checksum | CCCC                        | 16                      | 'CCCC' must be calculated correctly.  |
|                | Unused   | 0                           | 32                      |   |
|                | Data     | ICMPv6 packet defined on F1 | 50 octets * 8bits = 400 | Shall be as much of F1 as will fit without the ICMPv6 packet exceeding the MTU. |

- Frame Encoding

| Field          | Code (Hex)  |
|----------------|---|
| IPv6 Header    | 6000 0000 003A 3Axx<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000   |
| ICMPv6 message | 0104 xxxx 0000 0000<br>6000 0000 000A 11LL<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0000<br>FE80 0000 0000 0000<br>C8FE 00FF FE00 0001<br>0008 0008 000A ssss<br>0000 |

Note: 'x' means that these values are variable or allocated dynamically.

'LL' shall be same value as IPv6 hop limit field of the F1.

'sss' shall be same value as ICMPv6 checksum field of the F1.

#### (4) Expected Result

Following expected results shall be verified on this test case.

| Criteria | Verdicts   |
|----------|--|
| Step2    | TE must receive ICMPv6 Port Unreachable message (F1) from DUT. |

## 3. Test Reports

## 3.1. Front Page

|                              |                        |                                    |  |
|------------------------------|------------------------|------------------------------------|--|
| <b>Title</b>                 |                        | HATS G3-PLC L3/L4 Conformance Test |  |
| <b>Date/Time</b>             |                        |                                    |  |
| <b>Test Laboratory</b>       |                        |                                    |  |
| <b>Test Operator</b>         |                        |                                    |  |
| <b>DUT</b>                   | <b>Manufacturer</b>    |                                    |  |
|                              | <b>Product name</b>    |                                    |  |
|                              | <b>Version</b>         | <b>Hardware</b>                    |  |
|                              |                        | <b>Firmware</b>                    |  |
|                              |                        | <b>Control software</b>            |  |
|                              | <b>Serial No.</b>      |                                    |  |
| <b>Additional Info</b>       |                        |                                    |  |
| <b>TE</b>                    | <b>Manufacturer</b>    |                                    |  |
|                              | <b>Product name</b>    |                                    |  |
|                              | <b>Version</b>         |                                    |  |
|                              | <b>Serial No.</b>      |                                    |  |
|                              | <b>Additional Info</b> |                                    |  |
| <b>Test Specification</b>    | <b>Title</b>           |                                    |  |
|                              | <b>Revision</b>        |                                    |  |
| <b>Author of this report</b> |                        |                                    |  |

3.2. 2.1 ICMPv6 Echo Request and Reply

| 2.1 ICMPv6 Echo Request and Reply  |           |                        |
|--|-----------|------------------------|
| <b>2.1.1. Generation and Transmission of ICMPv6 Echo Request message</b>           |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Result   |           |                        |
| <b>2.1.2. Generation and Transmission of ICMPv6 Echo Reply message</b>             |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Result   |           |                        |
| <b>2.1.3. Received IPv6 Packet Filtering on the destination address</b>            |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Result   |           |                        |
| <b>2.1.4. Reception of ICMPv6 Echo Request message destined to all nodes group</b> |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Step4  |           |                        |
| Step6  |           |                        |
| Result   |           |                        |
| <b>2.1.5. Reception of ICMPv6 with incorrect checksum</b>                          |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Step4  |           |                        |
| Step6  |           |                        |
| Result   |           |                        |
| <b>2.1.6. Reception of ICMPv6 without valid checksum value</b>                     |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Step4  |           |                        |
| Step6  |           |                        |
| Result   |           |                        |

3.3. 2.2 Reception of ICMPv6 Error Message

| 2.2. Reception of ICMPv6 Error Message                      |           |                        |
|---|-----------|------------------------|
| <b>2.2.1. Reception of ICMPv6 Address Unreachable</b>       |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step3   |           |                        |
| Step5   |           |                        |
| Result  |           |                        |
| <b>2.2.2. Reception of ICMPv6 Port Unreachable message</b>  |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step3   |           |                        |
| Step5   |           |                        |
| Result  |           |                        |
| <b>2.2.3. Reception of ICMPv6 Time Exceeded message</b>     |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step3   |           |                        |
| Step5   |           |                        |
| Result  |           |                        |
| <b>2.2.4. Reception of ICMPv6 Parameter Problem message</b> |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step3   |           |                        |
| Step5   |           |                        |
| Result  |           |                        |

3.4. 2.3 Transmission of ICMPv6 Error Messages

| 2.3. Transmission of ICMPv6 Error Messages                     |           |                        |
|--|-----------|------------------------|
| <b>2.3.1. Transmission of ICMPv6 Parameter Problem message</b> |           |                        |
| Criteria   | Verdict   | Additional Information |
|  | PASS/FAIL |                        |
| Step2  |           |                        |
| Result   |           |                        |

3.5. 2.4 Reception of ICMPv6 Error Message

| 2.4. UDP transmission and reception                                 |           |                        |
|---|-----------|------------------------|
| <b>2.4.1. Reception of Unicast UDP packet</b>                       |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step2   |           |                        |
| Result  |           |                        |
| <b>2.4.2. Transmission of Unicast UDP packet</b>                    |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step1   |           |                        |
| Result  |           |                        |
| <b>2.4.3. Filtering of unicast UDP packet destined to the other</b> |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step2   |           |                        |
| Result  |           |                        |
| <b>2.4.4. Reception of Multicast UDP packet</b>                     |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step2   |           |                        |
| Result  |           |                        |
| <b>2.4.5. Transmission of Multicast UDP packet</b>                  |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step1   |           |                        |
| Result  |           |                        |
| <b>2.4.6. Unicast UDP arrived on unavailable port number</b>        |           |                        |
| Criteria  | Verdict   | Additional Information |
|   | PASS/FAIL |                        |
| Step2   |           |                        |
| Result  |           |                        |