G3-PLC L3/L4相互接続試験
実施要領
ANNEX

HATS推進会議
（高度通信システム相互接続推進会議）
マルチメディア通信相互接続試験実施連絡会

変更履歴

版	改訂年月日	改訂内容	担当
1.0	2013.11.15	初版作成	秋山、加藤

目次

1. 概要

1.1. 関連文書

(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. 試験項目と規格との対応

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	I**TU-T Recommendation G.9901** Narrowband orthogonal frequency division multiplexing power line communication tranceivers - power spectral density specification	N/A	out of scope
2	**ITU-T Recommendation G.9903** Narrowband orthogonal frequency division multiplexing power line communication tranceivers for G3-PLC networks	N/A	out of scope
3	**ARIB STD-84** 電力線搬送通信設備（10kHz～450kHz）	N/A	out of scope
4	**IETF RFC 4944** Transmission of IPv6 Packets over IEEE 802.15.4 Network (6LoWPAN)	N/A	out of scope
5	**IETF RFC 2460** 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	**2.1.1, 2.1.2**	
	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

No.	Document Title / Section number and title	clause in this document	Remark
			specification is defined here.
	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	**IETF RFC 4862** IPv6 Stateless Address Autoconfiguration		
	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	**2.1.1, 2.1.2**	
	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.

No.	Document Title / Section number and title		clause in this document	Remark
	5.5.4	Address Lifetime Expiry	N/A	No applicable technical 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	**IETF RFC 4443** 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, 2.2.3, 2.2.4, 2.2.5 2.2.6**	
	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	**2.3.3**	
	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.

No.	Document Title / Section number and title	clause in this document	Remark
8	**IETF RFC 768** User Datagram Protocol (UDP)		
	- Introduction	N/A	No technical specification is defined here.
	- Format	**2.4.1 2.4.2, 2.4.4, 2.4.5**	
	- Fields	**2.4.1, 2.4.2 2.4.4 2.4.5**	
	- 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	**The ECHONET Lite Specification Version 1.01**	N/A	

1.3. 序文

1.3.1. 目的

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

1.3.2. 適用範囲

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. システム構成

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

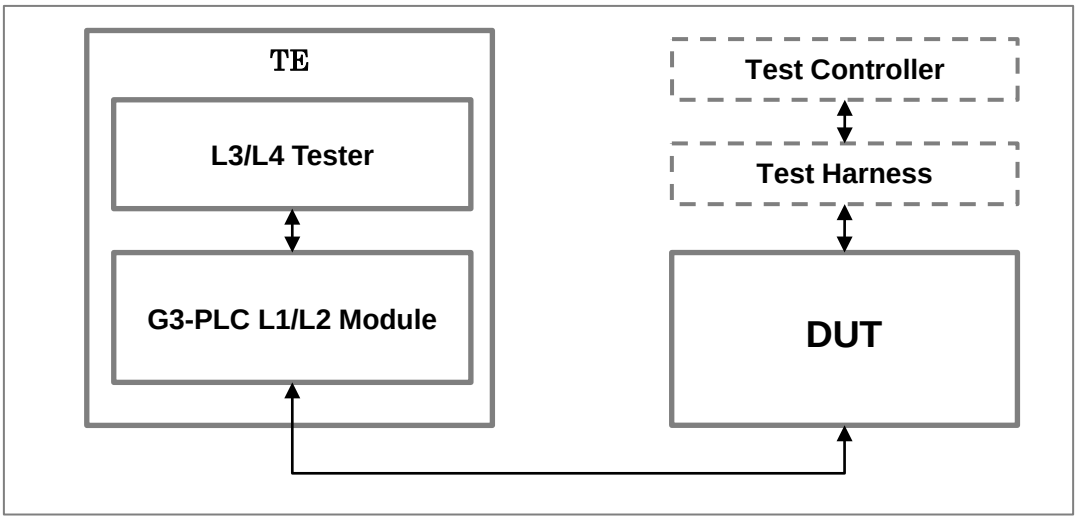

Figure 1.3.3-1 System Configuration

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. 共通初期化シーケンス

Test cases assume that the common initial sequence is executed in advance of individual test cases. This sequence is express 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. 共通規則

1.3.5.1. IPv6 インタフェース識別子の生成

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. バイト・ビット並びの表記

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. 共通設定

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	0x0001	
IPv6 Interface Identifier of TE	0xC8FE00FFFE000001	Based on 1.3.5.1
IPv6 address of TE	0xFE80000000000000 C8FE00FFFE000001	
MAC Address of DUT	0x0002	
IPv6 Interface Identifier of DUT	0xC8FE00FFFE000002	Based on 1.3.5.1
IPv6 address of DUT	0xFE80000000000000 C8FE00FFFE000002	

2. 試験手順

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.

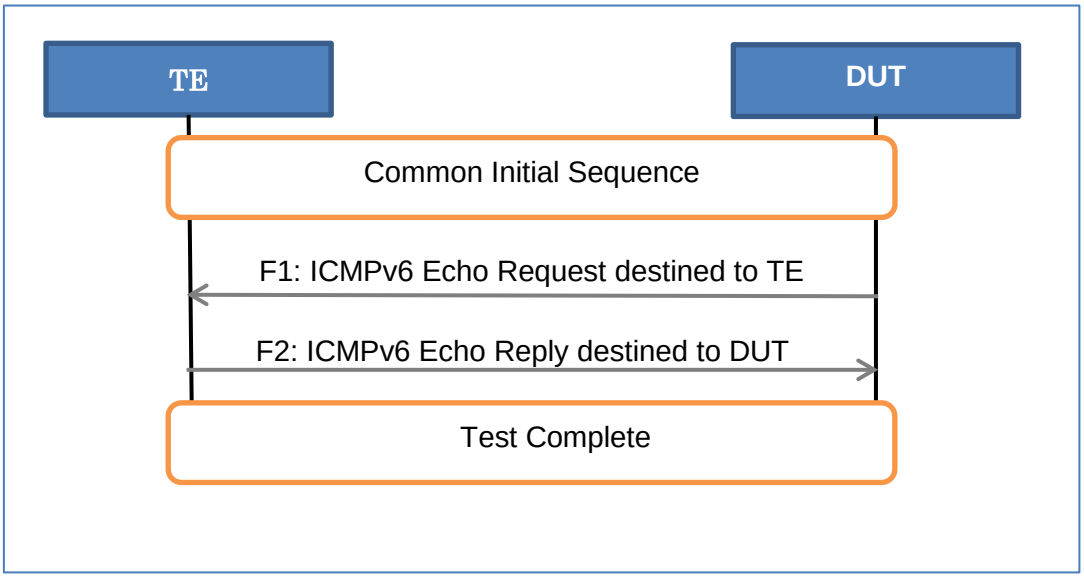

Figure 2.1.1-1 Message Sequence on Generation and Sending of ICMPv6 Echo Request message

(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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	8000 xxxx xxxx xxxx 6162 6364 6566 6768 696A 6B6C 6D6E 6F70 7172 7374 7576 7778 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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

エラー! 参照元が見つかりません。 shows message sequence on this test case.

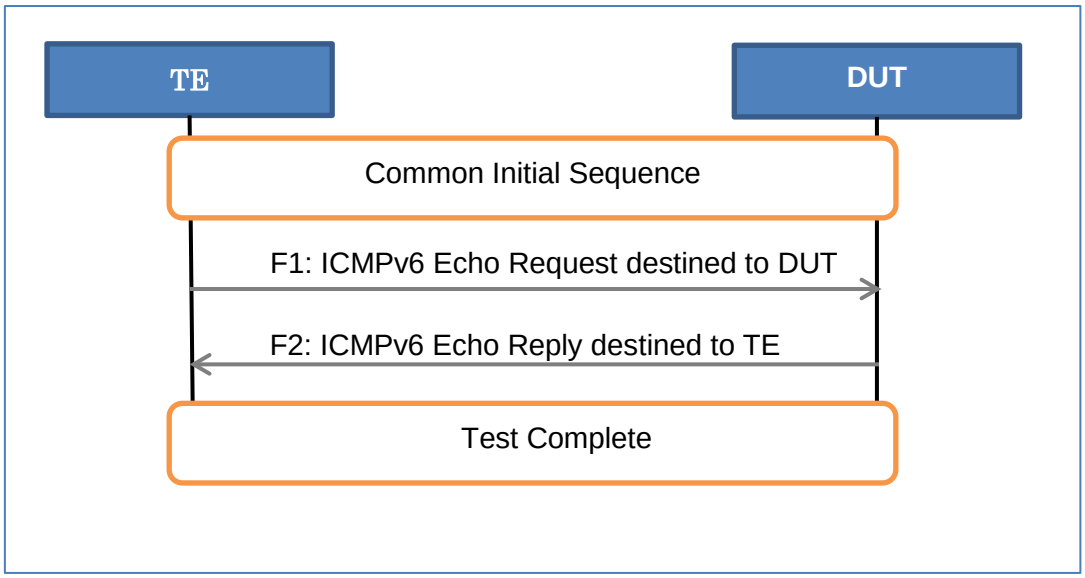

Figure 2.1.2-1 Message Sequence on Generation and Transmission of ICMPv6 Echo Reply

(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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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.

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)
	Hop limit	any value	8	

Layer	Field	Value	Length (bits)	Comment
	Source address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	Must be same as source address in F3.
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 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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 (F4) 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.

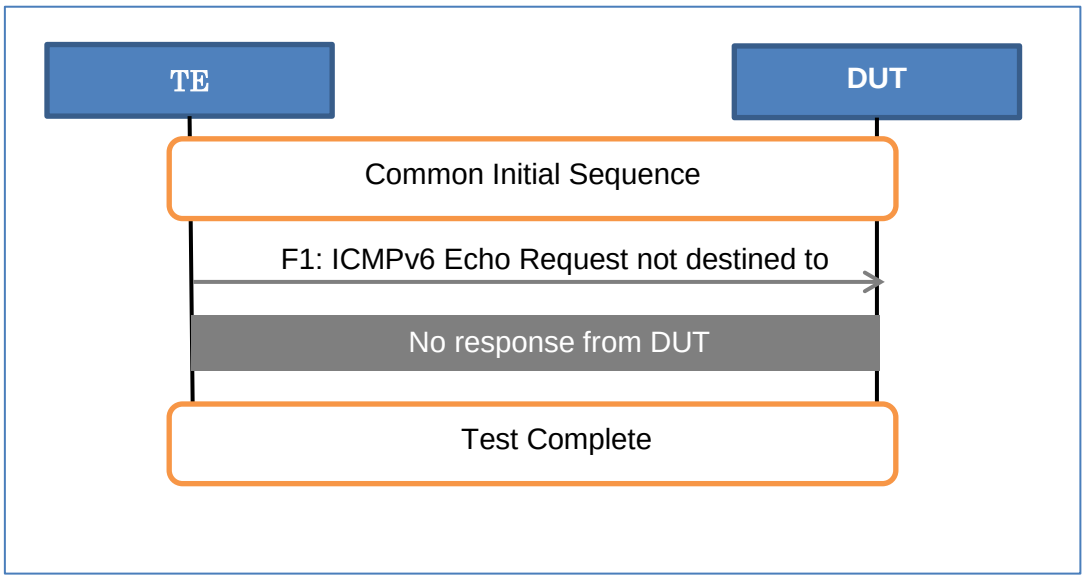

Figure 2.1.3-1 Message Sequence on IPv6 Packet Filtering on the destination address

(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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 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 0001 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 thatDUT does not respond to ICMPv6 Echo Request message destined to all nodes.

(1) Test Procedure

STEP1: Transmit **F1** (ICMPv6 Echo Request message destined to all nodes multicast group address) from TE.

STEP2: Confirm that no response is transmitted by DUT.

(2) Message Sequence

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

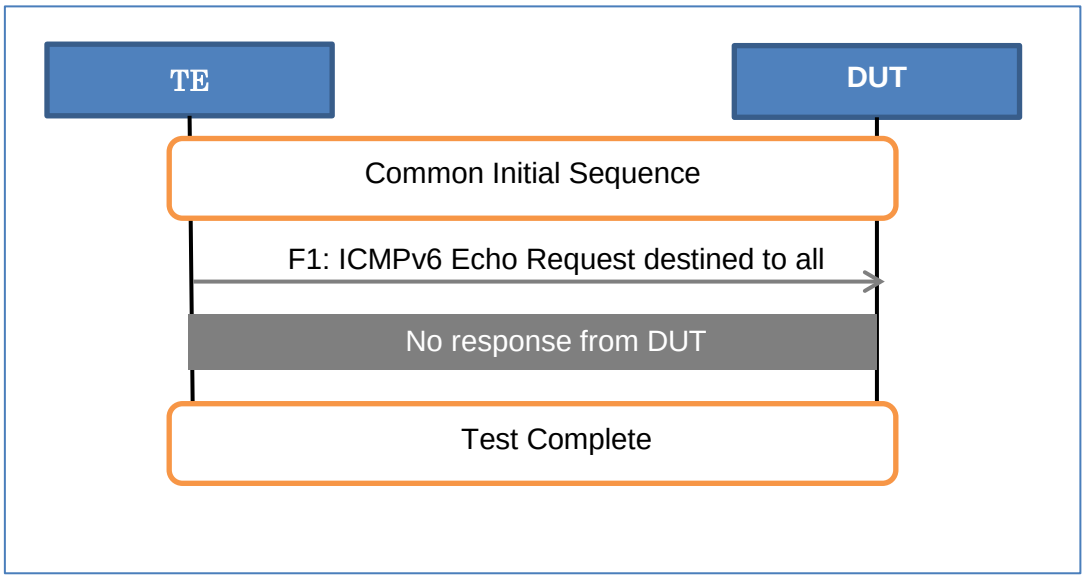

Figure 2.1.4-1 Message Sequence on Reception of ICMPv6 Echo Request destined to all nodes

(3) Packet Definition

Table 2.1.4-1 F1: ICMPv6 Echo Request 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 C8FE00FFFE000001	128	
	Destination address	**FF02::1**	128	All nodes multicast group address
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 0001 FF02 0000 0000 0000 0000 0000 0000 0001
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.

2.1.5. 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 message which has wrong checksum code) from TE to DUT.

STEP2: Confirm that no response is transmitted by DUT.

(2) Message Sequence

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

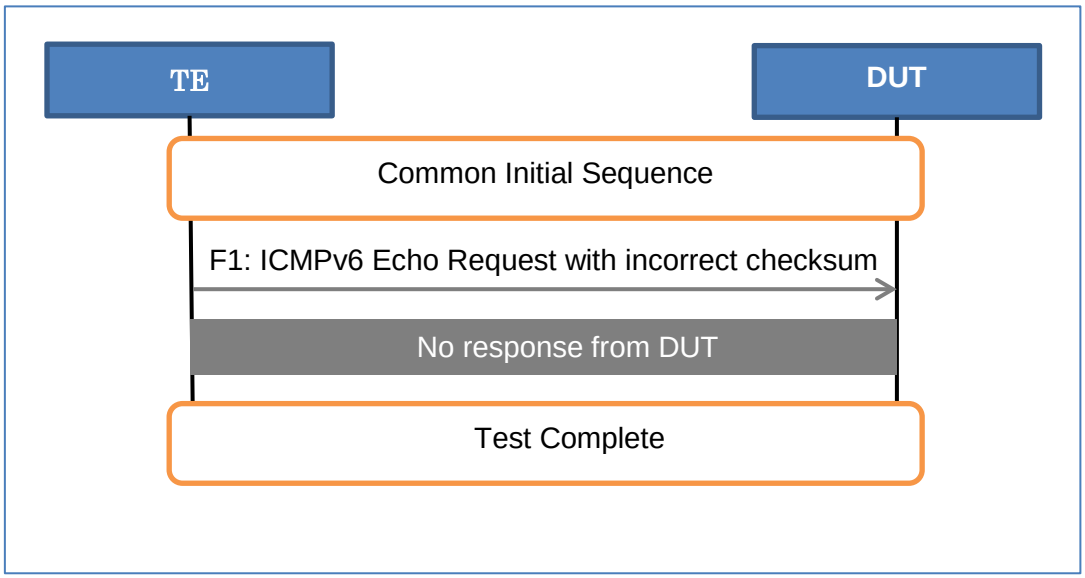

Figure 2.1.5-1 Message Sequence on Reception of ICMPv6 with incorrect checksum

(3) Packet Definition

Table 2.1.5-1 F1: ICMPv6 Echo Request 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
ICMPv6 message	Type	0x80	8	Echo Request (128)
	code	0	8	
	Checksum	CCCC	16	'CCCC' is wrong checksum.
	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 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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.

2.1.6. 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 message with 0x0000 of checksum value) from TE.

STEP2: Confirm that no response is transmitted by DUT.

(2) Test Procedure

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

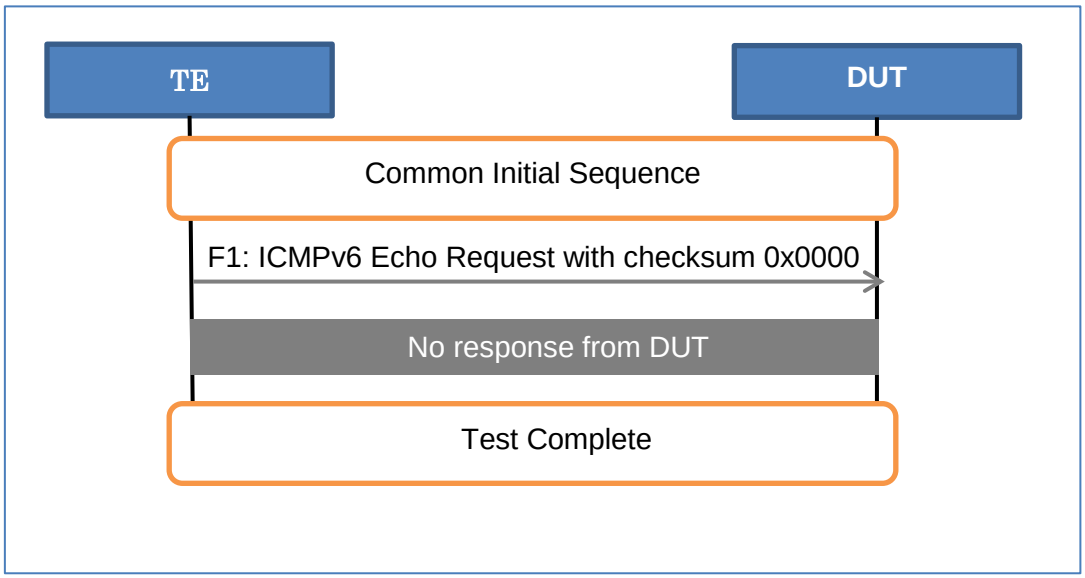

Figure 2.1.6-1 Message Sequence on Reception of ICMPv6 without valid checksum value

(3) Packet Definition

Table 2.1.6-1 F1: ICMPv6 Echo Request 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
ICMPv6 message	Type	0x80	8	Echo Request (128)
	code	0	8	
	Checksum	0x0000	16	Checksum is omitted.
	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 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
ICMPv6 message	8000 0000 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.

2.2. Reception of ICMPv6 Error Message

This section presents test cases which verify the behavior of DUT on receiving ICMPv6 Error message. 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 processes ICMPv6 error messages correctly and takes relevant behavior after that. TE transmits the Address Unreachable message, there is no response of DUT

(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.

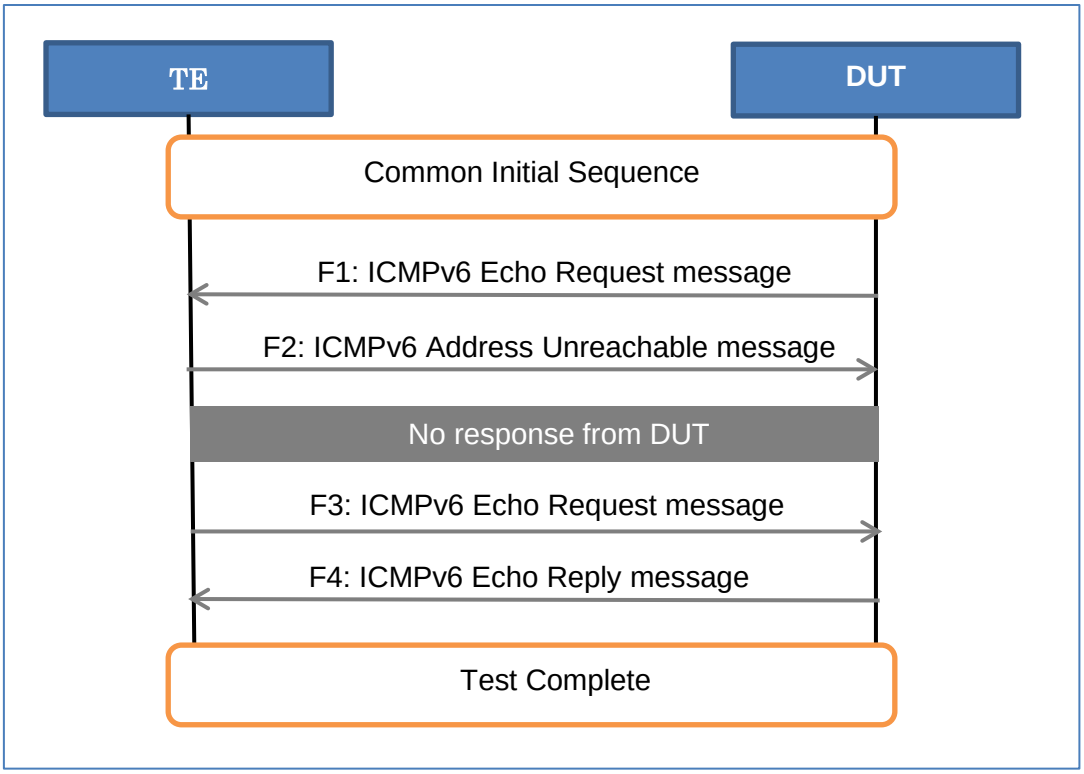

Figure 2.2.1-1 Message Sequence on Reception of ICMPv6 Address Unreachable

(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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	8000 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.

Table 2.2.1-2 F2: ICMPv6 Address Unreachable message

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	0x0058	16	
	Next header	0x3A	8	ICMPv6 (58)
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 * 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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
ICMPv6 message	0103 **xxxx** 0000 0000 6000 0000 0020 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE 00 0001 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.
'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	Version	6	4	

Layer	Field	Value	Length (bits)	Comment
Header	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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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 2.2.1-4 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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	TE

Layer	Field	Value	Length (bits)	Comment
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 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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. 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 if DUT does not respond to Port Unreachable message.

(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.

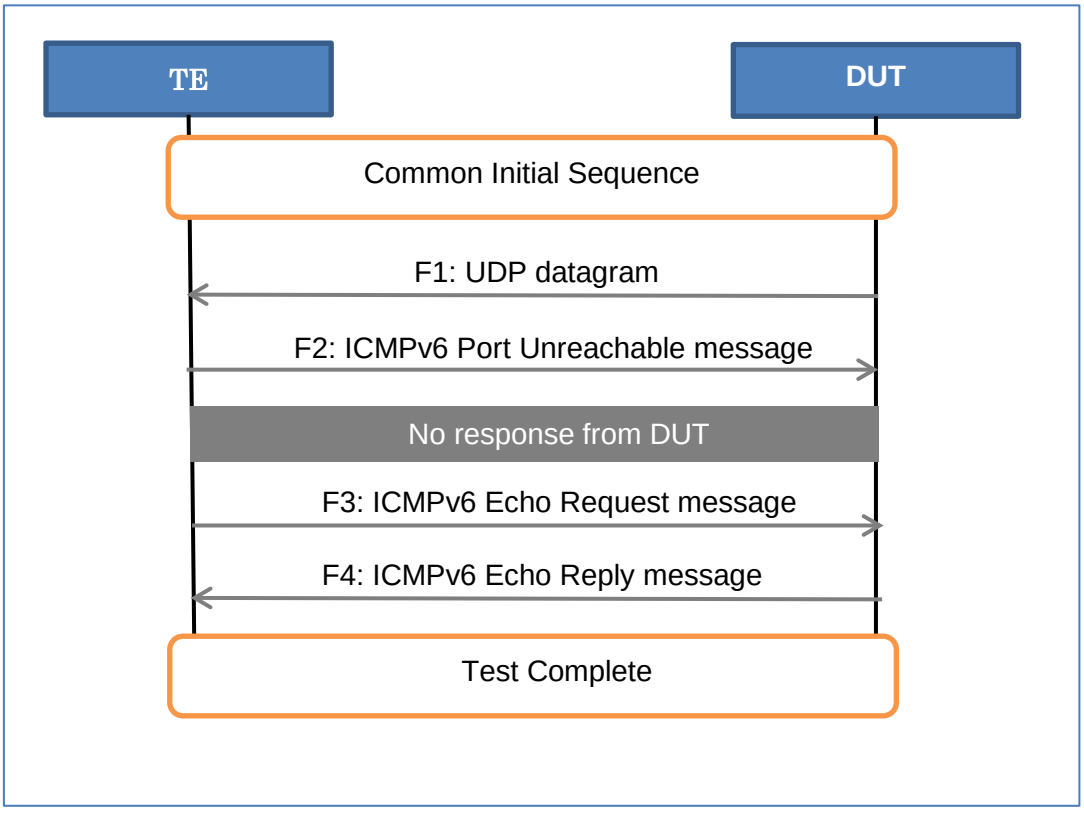

Figure 2.2.2-1 Message Sequence on Reception of ICMPv6 Port Unreachable

(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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
UDP datagram	xxxx 0E1A 0028 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.

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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 * 8bits = 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 FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
ICMPv6 message	0104 xxxx 0000 0000 6000 0000 0028 11xx FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE 00 0001 PPPP 0E1A 0028 SSSS 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.
‘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	
	Next header	0x3A	8	ICMPv6 (58)

Layer	Field	Value	Length (bits)	Comment
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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 2.2.2-4 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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	TE
ICMPv6 message	Type	0x81	8	Echo Reply (129)
	code	0	8	
	Checksum	CCCC	16	'CCCC' shall be calculated

Layer	Field	Value	Length (bits)	Comment
				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 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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. 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 Packet Too Big message

Since this error will never happen within G3-PLC network, this test case shall not defined in this document.

2.2.4. Reception of ICMPv6 Time Exceeded message

This test case verifies that DUT does not respond to Time Exceeded message.

(1) Test Procedure

STEP1: Transmit F1 (ICMPv6 Echo Request message) from DUT.
STEP2: TE transmits F2 (Time Exceeded message) as response against F7 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 2.2.4-1shows message sequence on this test case.

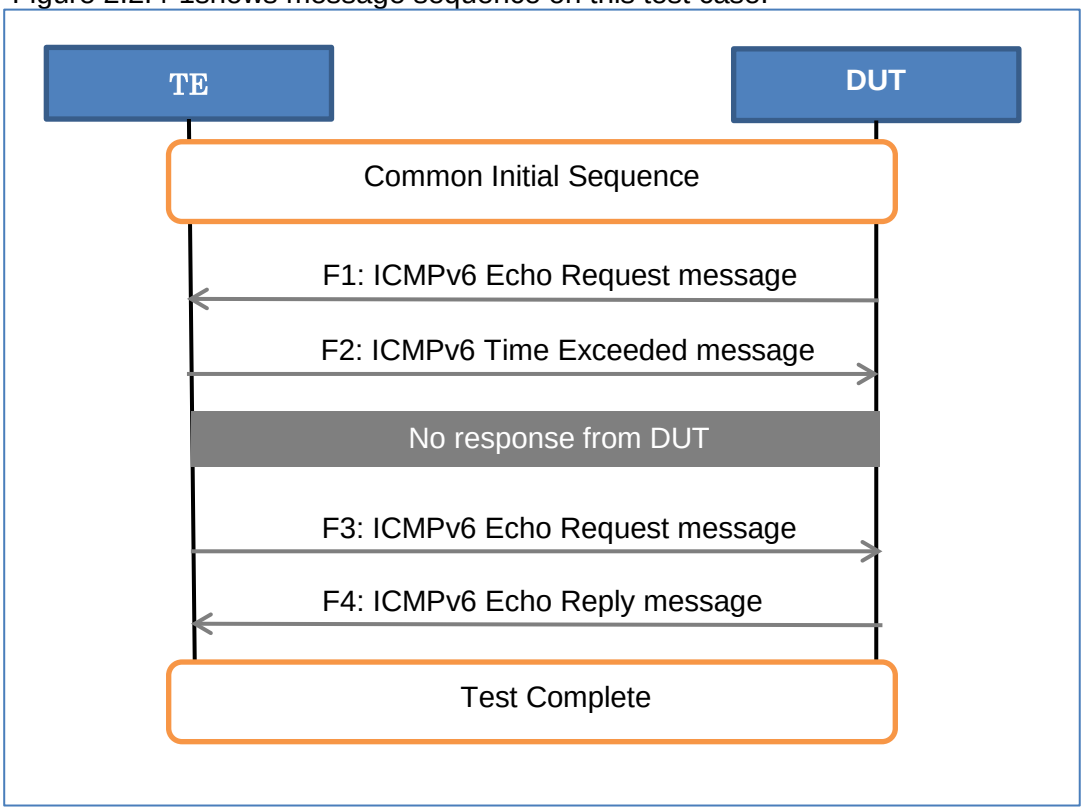

Figure 2.2.4-1 Message Sequence on Reception of ICMPv6 Time Exceeded message

(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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	8000 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.

Table 2.2.4-2 F2: ICMPv6 Time Exceeded message

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

Layer	Field	Value	Length (bits)	Comment
	Payload length	0x0058	16	
	Next header	0x3A	8	ICMPv6 (58)
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
ICMPv6 message	0300 xxxx 0000 0000 6000 0000 0028 3A**LL** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE 00 0001 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 2.2.4-3 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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 2.2.4-4 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 C8FE00FFFE000002	128	DUT
	Destination	0xFE80000000000000	128	TE

Layer	Field	Value	Length (bits)	Comment
	address	C8FE00FFFE000001		
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 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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. 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.

2.2.5. Reception of ICMPv6 Parameter Problem message

TE transmits the ICMPv6 Parameter Problem message, there is no response of DUT.

(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 2.2.5-1 shows message sequence on this test case.

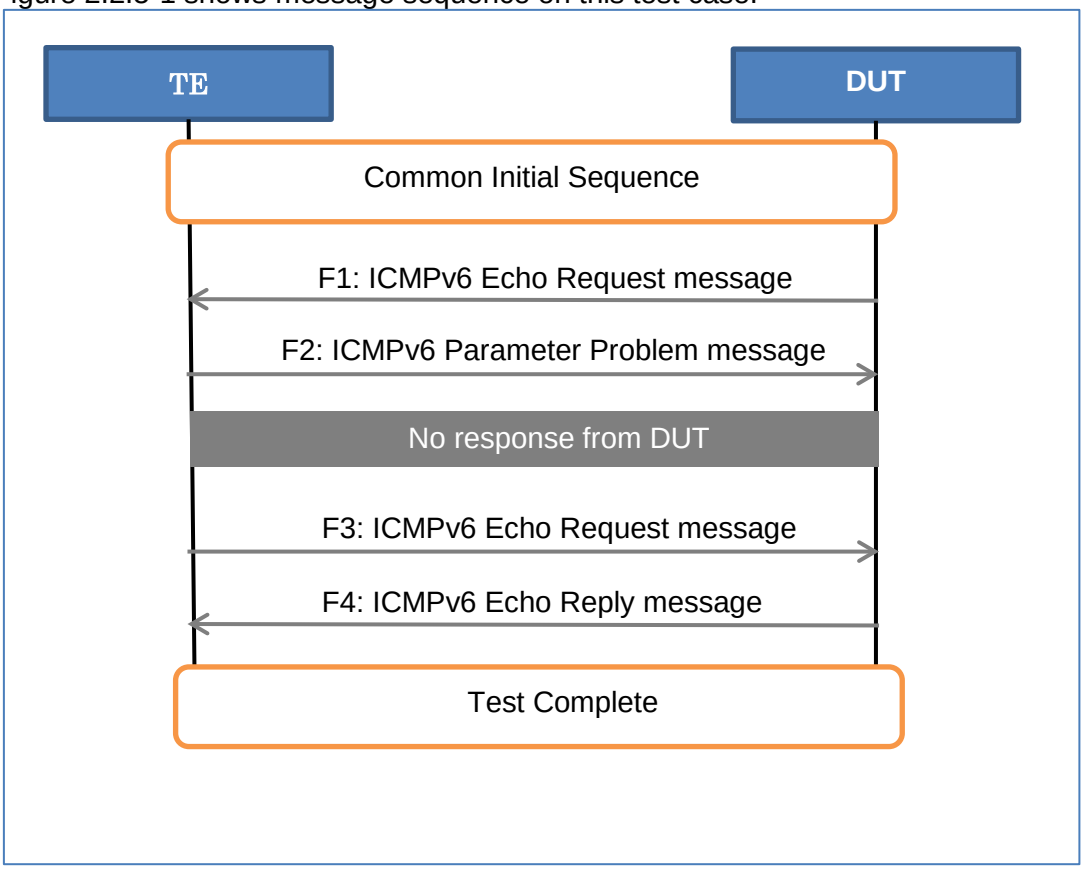

Figure 2.2.5-1 Message Sequence on Reception of ICMPv6 Parameter Problem message

(3) Packet Definition

Table 2.2.5-1 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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	8000 **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.

Table 2.2.5-2 F2: ICMPv6 Parameter Problem message

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

Layer	Field	Value	Length (bits)	Comment
	Payload length	0x0058	16	
	Next header	0x3A	8	ICMPv6 (58)
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 * 8 bits = 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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE 00 0002
ICMPv6 message	0400 **xxxx** 0000 0000 6000 0000 0028 3A**LL** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001 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 2.2.5-3 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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 2.2.5-4 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
		C8FE00FFFE000002		
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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. 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.

2.2.6. Reception of ICMPv6 Address Unreachable message

TE transmits the ICMPv6 Address Unreachable message, there is no response of DUT

(1) Test Procedure

STEP1: Transmit F1 (ICMPv6 Address Unreachable message) from TE to DUT intentionally.
STEP2: Confirm that no reaction against F1 by DUT..
STEP3: TE transmits F2 (ICMPv6 Echo Request message) to DUT.
STEP4: Confirm that DUT transmits F3 (ICMPv6 Echo Reply message) as the response to F2, without any harmful influence from the error events caused previously.

(2) Message Sequence

Figure 2.2.6-1 shows message sequence on this test case.

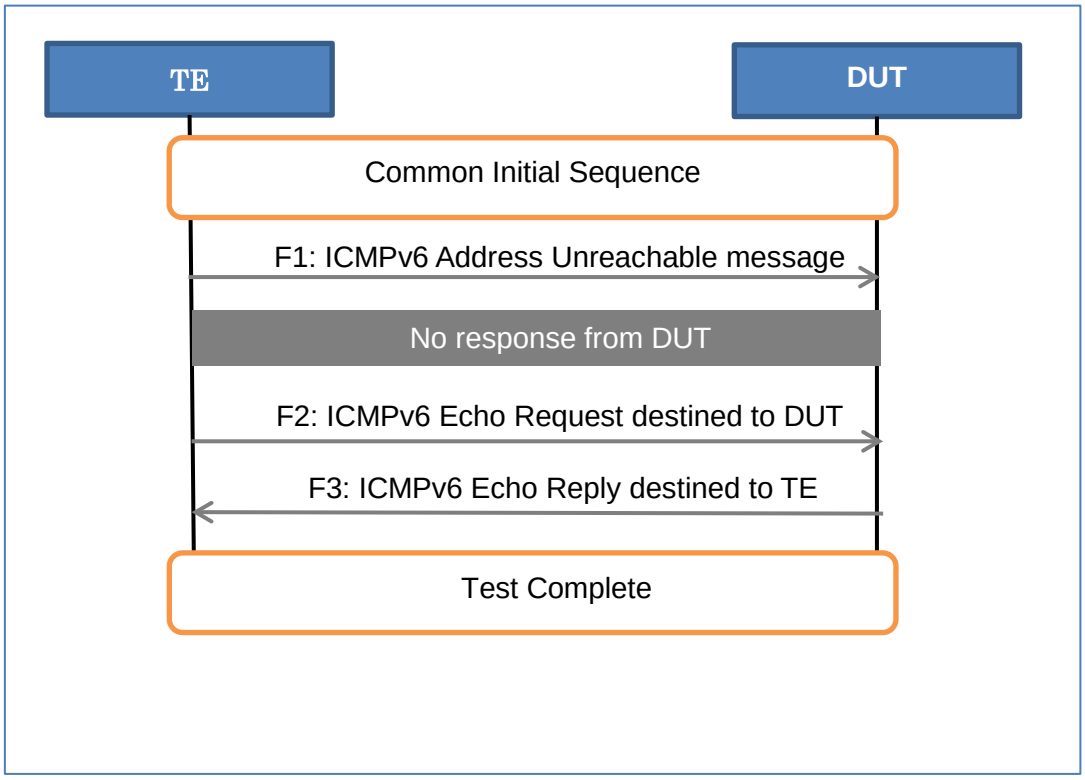

Figure 2.2.6-1 Message sequence on Reception of ICMPv6 Address Unreachable message

(3) Packet Definition

Table 2.2.6-1 F1: ICMPv6 Address Unreachable 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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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	"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 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
ICMPv6 message	0103 **xxxx** 0000 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 2.2.6-2 F2: 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	

Layer	Field	Value	Length (bits)	Comment
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
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.

Table 2.2.6-3 F3: 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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	TE
ICMPv6 message	Type	0x81	8	Echo Reply (129)
	code	0	8	
	Checksum	CCCC	16	'CCCC' shall be calculated correctly.
	Identifier	0x001	16	Must be same ID as F2..
	Sequence	0x0000	16	Must be same S as F2.

Layer	Field	Value	Length (bits)	Comment
	Data	"abc…xyzabcdef"	256	Must be same Data as F2.

- Frame Encoding

Field	**Code (Hex)**
IPv6 Header	6000 0000 0028 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
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	No response must receive from DUT. Observe received packet on DUT and confirm it is same as F1.
Step4	TE must receive ICMPv6 Echo Reply message (F3) from DUT as usual.

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 Packet Too Big message

Since this will never happen within G3-PLC network, this test case shall not be defined in this document..

2.3.2. Transmission of ICMPv6 Time Exceeded message

Since this will never happen within G3-PLC network, this test case shall not be defined in this document.

2.3.3. 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 2.3.3-1 shows message sequence on this test case.

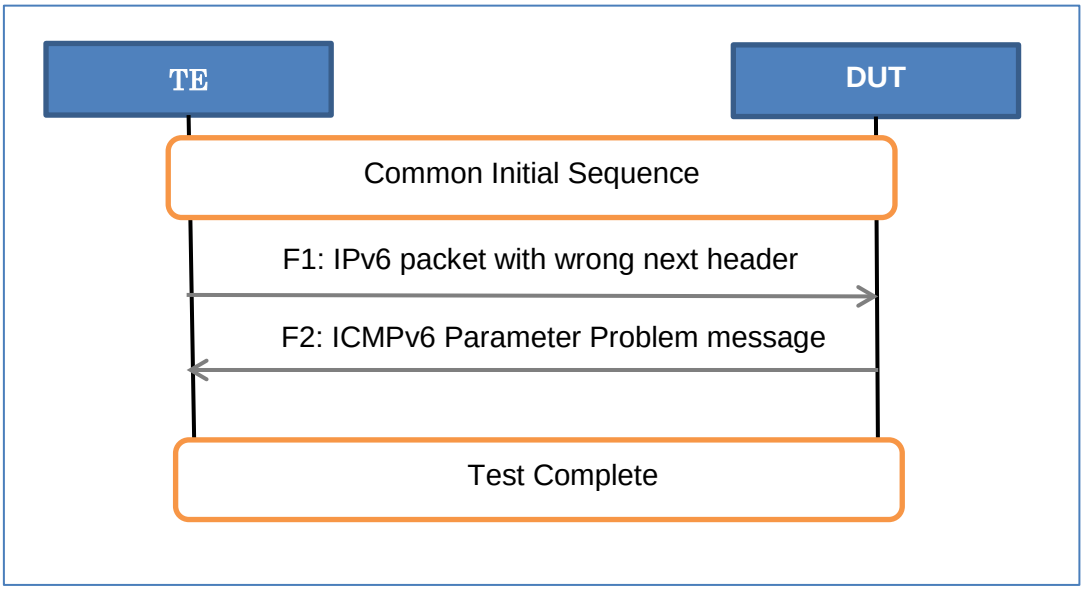

Figure 2.3.3-1 Message Sequence on Transmission of ICMPv6 Parameter Problem

(3) Packet Definition

Table 2.3.3-1 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	0xFF	8	Reserved value
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
IPv6 Payload	Data	32 octets of 0xFF	256	

- Frame Encoding

Field	**Code (Hex)**
IPv6 Header	6000 0000 0020 FF**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
IPv6 Payload	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF

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

Table 2.3.3-2 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	0x0050	16	
	Next header	0x3A	8	ICMPv6 (58)
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	TE
ICMPv6 message	Type	0x04	8	Parameter Problem
	code	0	8	Erroneous header field encountered
	Checksum	CCCC	16	'CCCC' must be

Layer	Field	Value	Length (bits)	Comment
				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	IPv6 packet defined on F1	72 octets * 8 bits = 576	N shall be as much of F1 as will fit without the IPv6 packet exceeding the MTU.

- Frame Encoding

Field	**Code (Hex)**
IPv6 Header	6000 0000 0050 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	0400 **xxxx** 0000 0000 6000 0000 0020 FF**LL** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE 00 0002 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF

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.

(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 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

TE transmits unicast UDP packet contained ECHONET Lite GET, DUT transmit unicast UDP packet contained ECHONET Lite GET_RES as a response.

(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.

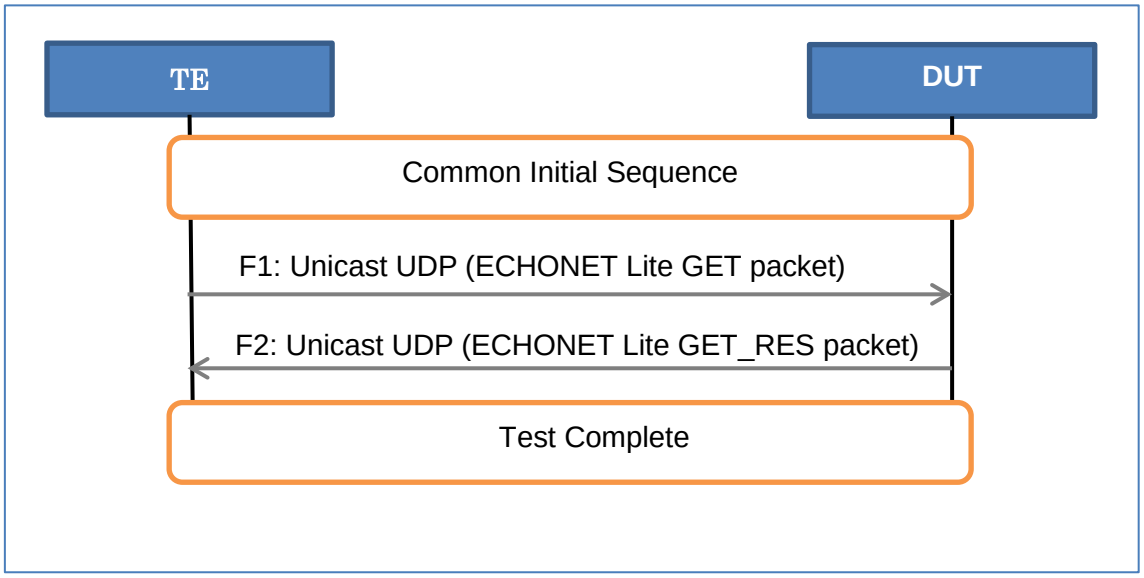

Figure 2.4.1-1 Message sequence on Reception of Unicast UDP packet

(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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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 11**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE 00 0002
UDP Header	0E1A 0E1A 0016 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E 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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	128	TE
UDP Header	Source port	3610	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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE 00 0001
UDP Header	0E1A 0E1A 0017 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E 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

DUT transmits unicast UDP packet contained ECHONET Lite GET, TE transmit unicast UDP packet contained ECHONET Lite GET_RES as a response.

(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.

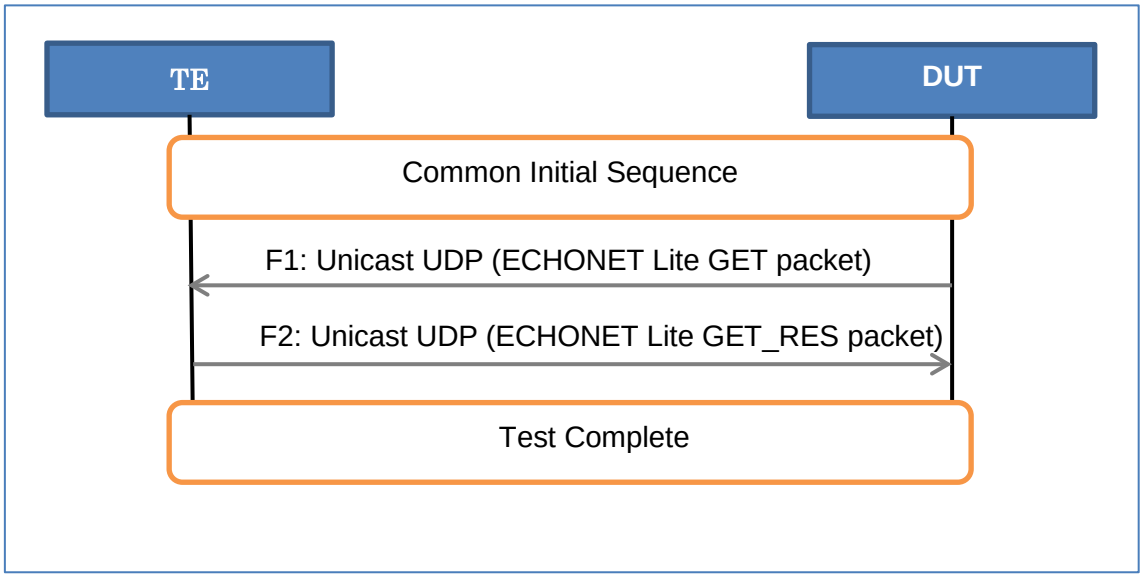

Figure 2.4.2-1 Message sequence on Transmission of Unicast UDP packet

(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 C8FE00FFFE000002	128	DUT
	Destination address	0xFE80000000000000 C8FE00FFFE000001	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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
UDP Header	**xxxx** 0E1A 0016 **xxxx**
ECHONET Lite	1081 **xxxx** 0EF0 010E 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

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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
UDP Header	Source port	3610	16	
	Destination port	arbitrary	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 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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
UDP Header	0E1A **PPPP** 0017 **xxxx**
ECHONET Lite	1081 **TTTT** 0EF0 010E F001 7201 8001 **VV**

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.

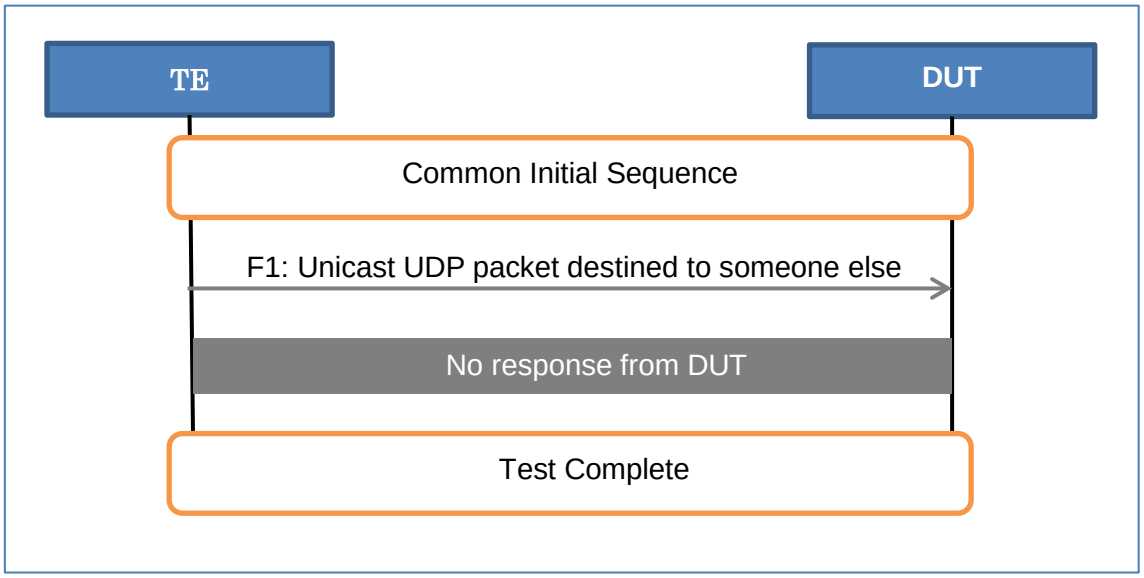

Figure 2.4.3-1 Message sequence on Filtering of unicast UDP packet destined to the other

(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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 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.
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 11**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 00AA
UDP Header	**0E1A** 0E1A 0016 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E 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.

2.4.4. 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.

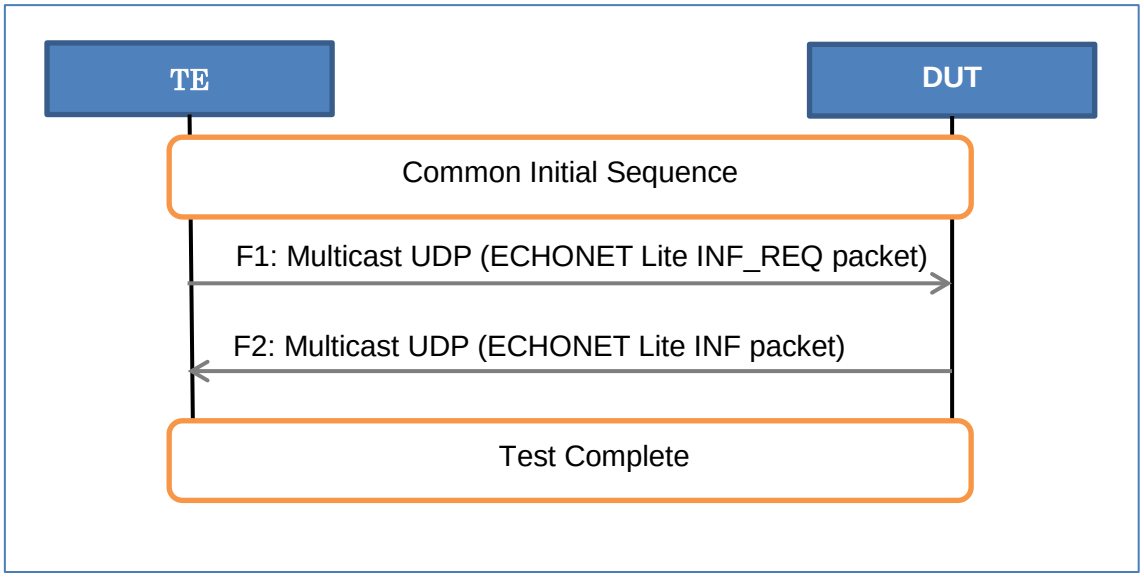

Figure 2.4.4-1 Message sequence on Reception of Multicast UDP packet

(3) Packet Definition

Table 2.4.4-1 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 C8FE00FFFE000001	128	TE
	Destination address	**FF02::1**	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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FF02 0000 0000 0000 0000 0000 0000 0001
UDP Header	**0E1A** 0E1A 0016 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E F001 6301 8000

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

Table 2.4.4-2 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	0xFE8000000000000 0 C8FE00FFFE000002	128	DUT
	Destination address	**FF02::1**	128	All nodes group address
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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FF02 0000 0000 0000 0000 0000 0000 0001
UDP Header	**0E1A** 0E1A 0017 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E F001 7301 8000 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
Step2	TE must receive multicast UDP packet (F1) from DUT.

2.4.5. 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 F8.

(2) Message Sequence

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

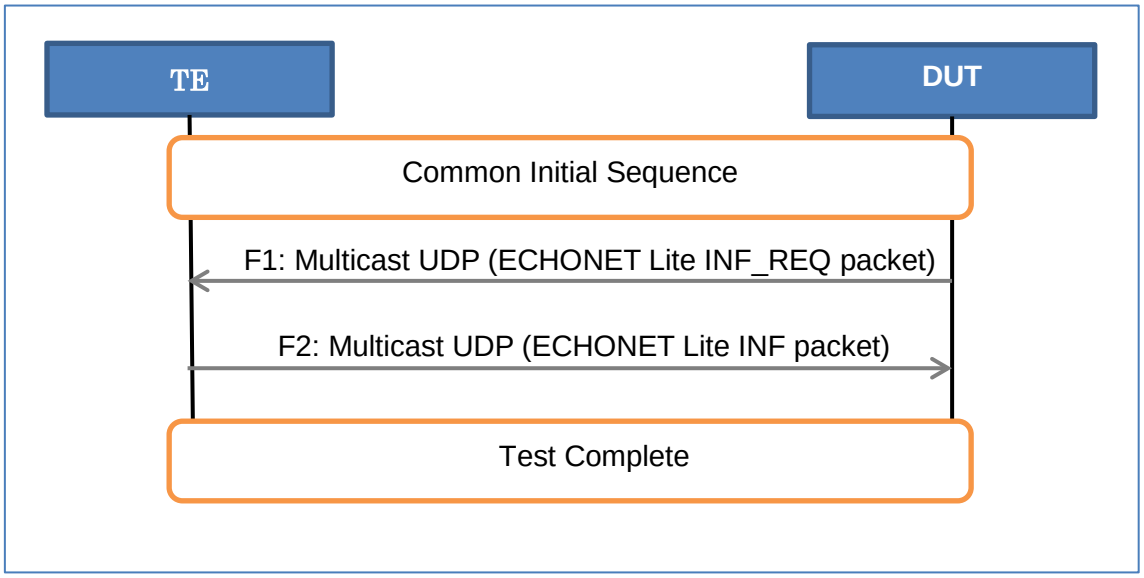

Figure 2.4.5-1 Message sequence on Reception of Multicast UDP packet

(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 C8FE00FFFE000002	128	DUT
	Destination address	**FF02::1**	128	
UDP Header	Source port	arbtrary	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	'-	No ECHONET Lite Data

- Frame Encoding

Field	**Code (Hex)**
IPv6 Header	6000 0000 0016 11**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FF02 0000 0000 0000 0000 0000 0000 0001
UDP Header	**xxxx** 0E1A 0016 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E 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

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 C8FE00FFFE000001	128	TE
	Destination address	**FF02::1**	128	
UDP Header	Source port	3610	16	
	Destination port	arbtrary	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**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FF02 0000 0000 0000 0000 0000 0000 0001
UDP Header	0E1A PPPP 0017 **xxxx**
ECHONET Lite	1081 1234 0EF0 010E 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.

2.4.6. 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.

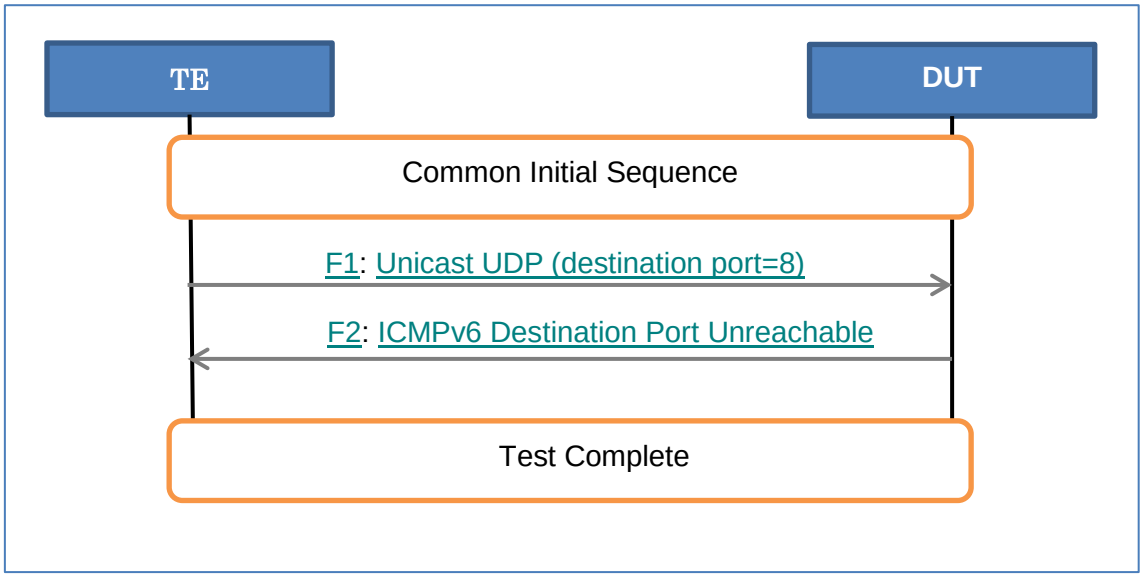

Figure 2.4.6-1 Message sequence on Unicast UDP arrived on unavailable port number

(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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	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`**`xx`**
	`FE80 0000 0000 0000`
	`C8FE 00FF FE00 0001`
	`FE80 0000 0000 0000`
	`C8FE 00FF FE00 0002`

UDP Header	`0008 0008 000A` **`xxxx`**
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	0x40	16	
	Next header	0x3A	8	ICMPv6 (58)
	Hop limit	any value	8	
	Source address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
	Destination	0xFE80000000000000	128	TE

Layer	Field	Value	Length (bits)	Comment
	address	C8FE00FFFE000001		
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	58	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 0050 3A**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0002 FE80 0000 0000 0000 C8FE 00FF FE00 0001
ICMPv6 message	0104 **xxxx** 0000 0000 6000 0000 000A 11**LL** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002 0008 0008 000A **SSSS** 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.
'**SSSS**' 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.

2.4.7. Reception of unicast UDP packet with incorrect checksum value

This test case verifies that DUT can drop UDP packet which has incorrect checksum value.

(5) Test Procedure

STEP3: Transmit F1 (unicast UDP packet which has incorrect UDP checksum value) from TE destined to the DUT.

STEP4: Confirm that no response from DUT to F1.

(6) Message Sequence

Figure 2.4.7-1 shows message sequence on this test case.

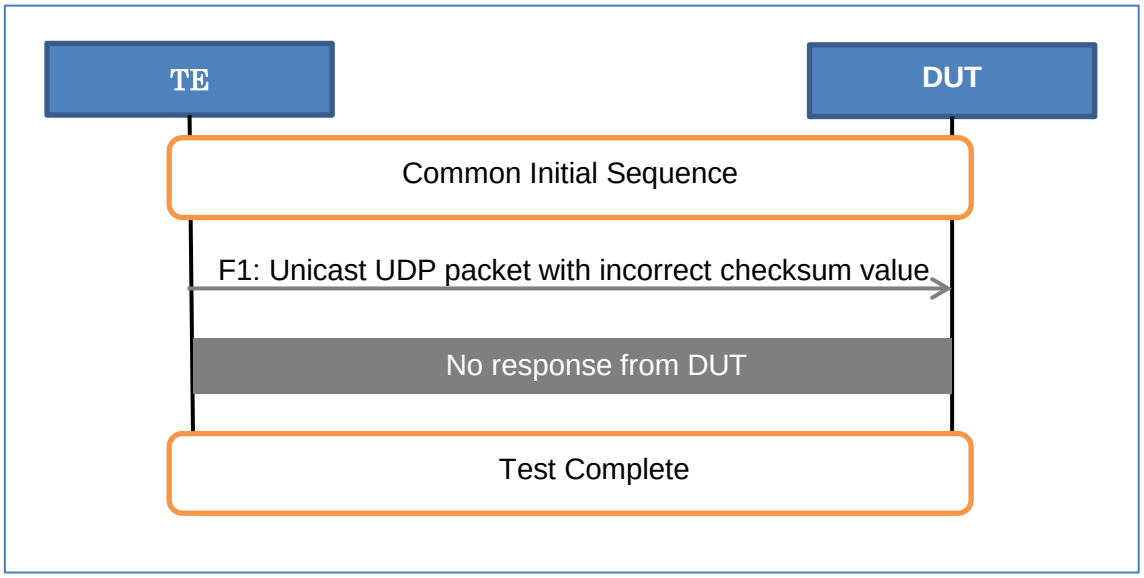

Figure 2.4.7-1 Message sequence on Reception of unicast UDP with incorrect UDP checksum

(7) Packet Definition

Table 2.4.7-1 F1: Unicast UDP packet with incorrect checksum value.

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 C8FE00FFFE000001	128	TE
	Destination address	0xFE80000000000000 C8FE00FFFE000002	128	DUT
UDP Header	Source port	3610	16	
	Destination port	3610	16	
	Length	0x0016	16	.L is length of the UDP datagram consist of UDP header and data part.
	Checksum	ZZZZ	16	'ZZZZ' must be incorrect checksum value.
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 11**xx** FE80 0000 0000 0000 C8FE 00FF FE00 0001 FE80 0000 0000 0000 C8FE 00FF FE00 0002
UDP Header	0E1A 0E1A 0016 **ZZZZ**
ECHONET Lite	1081 1234 0EF0 010E F001 6201 8000

Note: 'x' means that these values are variable or allocated dynamically.
'ZZZZ' shall be incorrect UDP checksum value.

(8) Expected Result

Following expected results shall be verified on this test case.

Criteria	Verdicts
Step2	No response must receive from DUT.