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Technical Specification

Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT): IPv4 to IPv6 Transitioning; Interoperability Test Suite



Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS).

Introduction

IPv6 is the next generation Internet. It gives vastly increased address space and true end-to-end communication. It has improved security and mobility features and allows 'plug-and-play' connection to the network. The complexity of implementing IPv6 technology and the relative openness of IETF standards means that wide-ranging and effective testing of IPv6 products will be one of the key factors in ensuring the deployment, interoperability, security and reliability of the IPv6 infrastructure.

The present document specifies interoperability tests for IPv4 to IPv6 Transitioning. The test suite results from and analysis of RFC 2529 [4], RFC 2765 [5], RFC 2766 [6], RFC 3056 [7], RFC 3596 [8], RFC 4213 [9] and RFC 4214 [10], the extraction of the requirements contained in these documents, and a selection of the requirements which could be tested by interoperability means.

The methodology and framework used to analyse the RFCs, to extract the requirements, write the Test Purposes, and the test descriptions is described in TS 102 351 [1]. The reader is strongly encouraged to read TS 102 351 [1] in order to make the best usage of the present document.

1 Scope

The present document specifies the interoperability Test Descriptions (TDs) with integrated Test Purposes (TPs) for the selected IPv4 to IPv6 TRansitioning standards. The TDs are presented in the tabular form specified in TS 102 424 [11] and the TPs are defined using the TPLan notation also described in ES 202 553 [2].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI TS 102 351: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".
- [2] ETSI ES 202 553: "Methods for Testing and Specification (MTS); TPLan: A notation for expressing test Purposes".
- [3] ETSI TS 102 599 "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT): IPv6 to IPv4 Transitioning; Requirements Catalogue".
- [4] IETF RFC 2529: "Transmission of IPv6 over IPv4 Domains without Explicit Tunnels".
- [5] IETF RFC 2765: "Stateless IP/ICMP Translation Algorithm (SIIT)".
- [6] IETF RFC 2766: "Network Address Translation - Protocol Translation (NAT-PT)".
- [7] IETF RFC 3056: "Connection of IPv6 Domains via IPv4 Clouds".
- [8] IETF RFC 3596: "DNS Extensions to support IP Version 6".
- [9] IETF RFC 4213: "Basic Transition Mechanisms for IPv6 Hosts and Routers".

- [10] IETF RFC 4214: "Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)".
- [11] ETSI TS 102 424: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Requirements of the NGN network to support Emergency Communication from Citizen to Authority".

3 Abbreviations

3.1 Abbreviations

For the purposes of the present document, the following abbreviations apply:

EUT	Equipment Under Test
MTU	Maximum Transmission Unit
PMTU	Path MTU
QE	Qualified Equipment
TP	Test Purpose
TD	Test Description
TPLan	Test Purpose Language
TSS	Test Suite Structure

4 IPv6 Security Interoperability Test Specification

4.1 Test Descriptions

The IPv6 Security Interoperability Test Descriptions (TDs) defined in the following clauses are derived from the Test Purposes (TPs) specified in annex B.

Test Description presentation and concepts are explained in TS 102 351 [1].

Requirements referred to within the Test Description (example: RQ_003_1016) are all contained in TS 102 599 [3], the IPv6 to IPv4 Transitioning "Requirements catalogue".

4.1.1 Index of test grouping

In the present document, tests have been grouped according to the original RFC from which they were extracted.

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NOTE: Test Descriptions covering requirements coming from more than one group are repeated in the relevant groups.

4.1.2 Test Descriptions

Group 1: RFC2529 - Transmission of IPv6 over IPv4 Domains without Explicit Tunnels

Test Description			
Identifier:	TD_TRA_1009_01	Test Purpose:	TP_TRA_1009_01
Summary:	"A 6over4 node builds a link-local address for an IPv4 virtual interface using the interface IPv4 address"		
Roles:	6over4_Node	Configuration:	CF_TRA_01
References:	RQ_003_1009, RQ_003_1012, RQ_003_1016		
<pre>with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the link_local_address of EUT } then { QE1 indicates receipt of the response from EUT } }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the link-local address of EUT.		
2	Check: does QE1 receive an Echo Reply from EUT	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_1027_01	Test Purpose:	TP_TRA_1027_01
Summary:	"A 6over4 router must join the all-nodes multicast address"		
Roles:	6over4_Router	Configuration:	CF_TRA_13
References:	RQ_003_1027		
<pre>with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the all_nodes_multicast_address } then { QE1 indicates receipt of the response from EUT } }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the all-nodes-multicast-address.		
2	Check: does QE1 receive an Echo Reply from EUT.	Yes	No
Observations:	Do not forget to put the virtual ethernet interface in the ping query.		

Test Description			
Identifier:	TD_TRA_1027_02	Test Purpose:	TP_TRA_1027_02
Summary:	"A 6over4 router must join the all-routers multicast address"		
Roles:	6over4_Router	Configuration:	CF_TRA_13
References:	RQ_003_1027		
<pre>with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the all_routers_multicast_address } then { QE1 indicates receipt of the response from EUT } }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the all-routers-multicast-address.		
2	Check: does QE1 receive an Echo Reply from EUT.	Yes	No
Observations:	Do not forget to put the virtual ethernet interface in the ping query.		

Test Description			
Identifier:	TD_TRA_1027_03	Test Purpose:	TP_TRA_1027_03
Summary:	"A 6over4 router must join the solicited-node multicast address corresponding to its IPv6 address"		
Roles:	6over4_Router	Configuration:	CF_TRA_13
References:	RQ_003_1027		
<pre>with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the solicited_node_multicast_address of EUT } then { QE1 indicates receipt of the response from EUT } }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the solicited-node-multicast-address of the EUT.		
2	Check: does QE1 receive an Echo Reply from EUT.	Yes	No
Observations:	Do not forget to put the virtual ethernet interface in the ping query.		

Group 2: RFC2765 - Stateless IP/ICMP Translation Algorithm (SIIT)

Group 2.1: Translating from IPv4 to IPv6

Test Description			
Identifier:	TD_TRA_3003_01	Test Purpose:	TP_TRA_3003_01
Summary:	"When the IPv4 Sender does not perform PMTU discovery, the translator shall fragment the IPv4 packet so that it fits in 1280 bytes IPv6"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3003		
<pre>with { EUT configured not to use PMTU on Network_A } ensure that { when { QE1 sends a packet of length 1500 indicating that a response is requested to QE2 } then { QE1 indicates receipt of the response from QE2 } }</pre>			
Pre-test conditions:	EUT configured not to use PMTU on Network_A		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request of length 1500 to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3014_01	Test Purpose:	TP_TRA_3014_01
Summary:	"The SIIT_Translator must copy the TTL value from IPv4 headers to the Hop Limit in the resulting IPv6 headers. During translation, the translator shall decrement the TTL value or IPv6 Hop Limit"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3014, RQ_003_3015		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested and indicating TTL of 4 to QE2 } then { QE1 indicates receipt of the response from QE2 } when { QE1 sends a packet indicating that a response is requested and indicating TTL of 3 to QE2 } then { QE1 receives no response from QE2 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request indicating TTL of 4 to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
3	Cause QE1 to send an Echo Request indicating TTL of 3 to QE2		
4	Check: does QE1 receive an Echo Reply from QE2	NO	YES
Observations:			

Test Description			
Identifier:	TD_TRA_3016_01	Test Purpose:	TP_TRA_3016_01
Summary:	"As part of forwarding the packet, if the translator has decremented the IPV4 TTL (before translation) it shall not decrement the IPv6 Hop Limit (After translation). The SIIT_Translator must not decrement 2 times."		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3016		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested and indicating TTL of 3 to QE2 } then { QE1 receives no response from QE2 } when { QE1 sends a packet indicating that a response is requested and indicating TTL of 4 to QE2 } then { QE1 indicates receipt of the response from QE2 } when { QE1 sends a packet indicating that a response is requested and indicating TTL of 5 to QE2 } then { QE1 indicates receipt of the response from QE2 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request indicating TTL of 3 to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	NO	YES
3	Cause QE1 to send an Echo Request indicating TTL of 4 to QE2		
4	Check: does QE1 receive an Echo Reply from QE2	YES	NO
5	Cause QE1 to send an Echo Request indicating TTL of 5 to QE2		
6	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3017_01	Test Purpose:	TP_TRA_3017_01
Summary:	"As part of decrementing the TTL value, the SIIT_Translator needs to check for zero and if present, send the ICMPv4 ttl exceeded error"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3017		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested and indicating TTL of 4 to QE2 } then { QE1 indicates receipt of the response from QE2 } when { QE1 sends a packet indicating that a response is requested and indicating TTL of 2 to QE2 } then { QE1 indicates Time_Exceeded } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request indicating TTL of 4 to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
3	Cause QE1 to send an Echo Request indicating TTL of 2 to QE2		
4	Check: does EUT indicate Time_Exceeded to QE1	YES	NO
Observations:	Check TP_TRA_3017_01, last "then" is perform by EUT.		

Test Description			
Identifier:	TD_TRA_3018_01	Test Purpose:	TP_TRA_3018_01
Summary:	"When translating IPv4 to IPv6, the IPv6 source Address and Destination field shall be constructed with the low-order 32bits (IPv4 Source or Destination) and the high-order 96bits (IPv4-mapped prefix or IPv4-translated"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3018, RQ_003_3019		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { QE1 indicates receipt of the response } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3037_01	Test Purpose:	TP_TRA_3037_01
Summary:	"A SIIT_Translator must be able to translate ICMPv4 Echo Requests to ICMPv6 Echo Requests, by changing the type and adjusting the checksum"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3034, RQ_003_3037, RQ_003_3038		
<pre> with { } ensure that { when { QE1 sends an Echo_Request to QE2 } then { QE1 indicates receipt of an Echo_Reply from QE2 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3039_01	Test Purpose:	TP_TRA_3039_01
Summary:	"A SIIT_Translator must be able to translate ICMPv4 Echo Replies to ICMPv6 Echo Replies, by changing the type and adjusting the checksum"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3034, RQ_003_3039, RQ_003_3040		
with { }			
ensure that { when { QE2 sends an Echo_Request to QE1 } then { QE2 indicates receipt of an Echo_Reply from QE1 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3051_01	Test Purpose:	TP_TRA_3051_01
Summary:	"A SIIT_Translator must translate ICMPv4 Destination Unreachable (net unreachable) messages to ICMPv6 Destination Unreachable (no route to destination) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3051		
with { QE3 configured with no route for IPv4_mapped_packets }			
ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { QE2 indicates that QE1 is not reachable } }			
Pre-test conditions:	QE3 is configured with no route for IPv4_mapped_packets		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE3 indicate Destination Unreachable (net unreachable) to QE2	YES	NO
Observations:	Check TP_TRA_3051_01, last "then" is perform by QE3.		

Test Description			
Identifier:	TD_TRA_3053_01	Test Purpose:	TP_TRA_3053_01
Summary:	"A SIIT_Translator must translate ICMPv4 Destination Unreachable (port unreachable) messages to ICMPv6 Destination Unreachable (port unreachable) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3053		
with { QE1 configured not to listen on UDP_port_80 }			
ensure that { when { QE2 sends a UDP_packet to QE1 on UDP_port_80 } then { QE2 indicates that the port is not reachable } }			
Pre-test conditions:	QE1 is configured not to listen on UDP_port_80		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an UDP_packet to QE1 on UDP_port_80		
2	Check: does QE3 indicate Destination Unreachable (port unreachable) to QE2	YES	NO
Observations:	What is the best option to cause QE2 sends a UDP_packet to QE1 on UDP_port_80?		

Test Description			
Identifier:	TD_TRA_3057_01	Test Purpose:	TP_TRA_3057_01
Summary:	"A SIIT_Translator must translate ICMPv4 Destination Unreachable (administratively prohibited) messages to ICMPv6 Destination Unreachable (administratively prohibited) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3057		
<pre> with { QE3 configured to block packets from QE2 } ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { QE2 indicates that communication with QE1 is administratively prohibited } } </pre>			
Pre-test conditions:	QE3 is configured to block packets from QE2 to QE1		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE3 indicate communication with QE1 is administratively prohibited to QE2	YES	NO
Observations:	Check TP_TRA_3057_01, last "then" is perform by QE3.		

Test Description			
Identifier:	TD_TRA_3059_01	Test Purpose:	TP_TRA_3059_01
Summary:	"A SIIT_Translator must translate ICMPv4 Time Exceeded messages to ICMPv6 Time Exceeded messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3059, RQ_003_3060		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested and indicating TTL of 4 to QE1 } then { QE2 indicates receipt of the response from QE1 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 3 to QE1 } then { QE2 indicates Time_Exceeded } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating TTL of 4 to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
3	Cause QE2 to send an Echo Request indicating TTL of 3 to QE1		
4	Check: does QE3 indicate Time_Exceeded to QE2	YES	NO
Observations:	Check TP_TRA_3059_01, last "then" is perform by QE3.		

Test Description			
Identifier:	TD_TRA_3063_01	Test Purpose:	TP_TRA_3063_01
Summary:	"A SIIT_Translator must translate IPv4 packets with an IPv4 address compatible with the pool of IPv4_Translated Address of IPv6 Nodes"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3063		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { QE2 indicates receipt of the response } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3064_01	Test Purpose:	TP_TRA_3064_01
Summary:	"A SIIT_Translator must translate ICMPv4 Destination Unreachable (host unreachable) messages to ICMPv6 Destination Unreachable (no route to destination) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3064		
<pre> with { QE1 disconnected } ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { QE2 indicates that QE1 is not reachable } } </pre>			
Pre-test conditions:	QE1 is disconnected from the Network_A		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE3 indicate QE1 is unreachable to QE2	YES	NO
Observations:	Check TP_TRA_3064_01, last "then" is perform by QE3.		

Group 2.2: Translating from IPv6 to IPv4

Test Description			
Identifier:	TD_TRA_3080_01	Test Purpose:	TP_TRA_3080_01
Summary:	"The SIIT_Translator must copy the Hop Limit from IPv6 headers to the TTL value in the resulting IPv4 headers. During translation, the translator shall decrement the IPv4 TTL value or IPv6 Hop Limit"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3080, RQ_003_3081		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested and indicating TTL of 4 to QE1 } then { QE2 indicates receipt of the response from QE1 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 3 to QE1 } then { QE2 receives no response from QE1 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating TTL of 4 to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
3	Cause QE2 to send an Echo Request indicating TTL of 3 to QE1		
4	Check: does QE2 receive an Echo Reply from QE1	NO	YES
Observations:			

Test Description			
Identifier:	TD_TRA_3082_01	Test Purpose:	TP_TRA_3082_01
Summary:	"As part of forwarding the packet, if the translator has decremented the IPv6 Hop Limit (before translation) it shall not decrement the IPv4 TTL (After translation). The SIIT_Translator must not decrement 2 times."		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3082		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested and indicating TTL of 3 to QE1 } then { QE2 receives no response from QE1 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 4 to QE1 } then { QE2 indicates receipt of the response from QE1 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 5 to QE1 } then { QE2 indicates receipt of the response from QE1 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating TTL of 3 to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	NO	YES
3	Cause QE2 to send an Echo Request indicating TTL of 4 to QE1		
4	Check: does QE2 receive an Echo Reply from QE1	YES	YES
5	Cause QE2 to send an Echo Request indicating TTL of 5 to QE1		
6	Check: does QE2 receive an Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_3083_01	Test Purpose:	TP_TRA_3083_01
Summary:	"As part of decrementing the TTL value, the SIIT_Translator needs to check for zero and if present, send the ICMPv6 ttl exceeded error"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3083		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested and indicating TTL of 4 to QE1 } then { QE2 indicates receipt of the response from QE1 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 2 to QE1 } then { QE2 indicates Time_Exceeded } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating TTL of 4 to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
3	Cause QE2 to send an Echo Request indicating TTL of 2 to QE1		
4	Check: does EUT indicate Time_Exceeded to QE2	YES	NO
Observations:	Check TP_TRA_3083_01, last "then" is perform by EUT.		

Test Description			
Identifier:	TD_TRA_3086_01	Test Purpose:	TP_TRA_3086_01
Summary:	"When translating Ipv6 to Ipv4, the resulting IPv4 Source Address (or Destination Address respectively) shall be the low-order 32 bits of the IPv6 Source Address (or the IPv6 Destination Address respectively)"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3086, RQ_003_3087		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { QE1 indicates receipt of the response } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
Observations:	Check TP_TRA_3083_01, the translation is from IPv6 to IPv4 (from QE2 to QE1)		

Test Description			
Identifier:	TD_TRA_3093_01	Test Purpose:	TP_TRA_3093_01
Summary:	"A SIIT_Translator must not translate packets with a non-zero Segments Left Field in the Routing header"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3093		
<pre> with { } ensure that { when { QE2 sends a packet with 0 route segments indicating that a response is requested to QE1 } then { QE2 indicates receipt of the response } when { QE2 sends a packet with 2 route segments indicating that a response is requested to QE1 } then { QE2 receives no response from QE1 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating 0 in the Segments Left Field in the Routing header to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	YES	NO
3	Cause QE2 to send an Echo Request indicating 2 in the Segments Left Field in the Routing header to QE1		
4	Check: does QE2 receive an Echo Reply from QE1	NO	YES
Observations:			

Test Description			
Identifier:	TD_TRA_3104_01	Test Purpose:	TP_TRA_3104_01
Summary:	"A SIIT_Translator must be able to translate ICMPv6 Echo Requests to ICMPv4 Echo Requests, by changing the type and adjusting the checksum"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3101, RQ_003_3104, RQ_003_3105		
<pre> with { } ensure that { when { QE2 sends an Echo_Request to QE1 } then { QE2 indicates receipt of an Echo_Reply from QE1 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_3106_01	Test Purpose:	TP_TRA_3106_01
Summary:	"A SIIT_Translator must be able to translate ICMPv6 Echo Replies to ICMPv4 Echo Replies, by changing the type and adjusting the checksum"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3101, RQ_003_3106, RQ_003_3107		
<pre> with { } ensure that { when { QE1 sends an Echo_Request to QE2 } then { QE1 indicates receipt of an Echo_Reply from QE2 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_3118_01	Test Purpose:	TP_TRA_3118_01
Summary:	"A SIIT_Translator must translate ICMPv6 Destination Unreachable (no route to destination) messages to ICMPv4 Destination Unreachable (host unreachable) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3117, RQ_003_3118		
<pre>with { QE4 configured with no route for IPv4_Translated_packets } ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { QE1 indicates that QE2 is not reachable } }</pre>			
Pre-test conditions:	QE4 is configured with no route for IPv4_translated_packets		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE4 indicate Destination Unreachable (net unreachable) to QE1	Yes	No
Observations:	QE4 will perform an ICMPv6 error message indicating Destination Unreachable.		

Test Description			
Identifier:	TD_TRA_3119_01	Test Purpose:	TP_TRA_3119_01
Summary:	"A SIIT_Translator must translate ICMPv6 Destination Unreachable (administratively prohibited) messages to ICMPv4 Destination Unreachable (administratively prohibited) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3117, RQ_003_3119		
<pre>with { QE4 configured to block packets from QE1 } ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { QE1 indicates that communication with QE2 is administratively prohibited } }</pre>			
Pre-test conditions:	QE4 is configured to block packets from QE1		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE4 indicate that communication with QE2 is administratively prohibited	Yes	No
Observations:	QE4 will perform an ICMPv6 error message (1/1)		

Test Description			
Identifier:	TD_TRA_3121_01	Test Purpose:	TP_TRA_3121_01
Summary:	"A SIIT_Translator must translate ICMPv6 Destination Unreachable (address unreachable) messages to ICMPv4 Destination Unreachable (host unreachable) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3117, RQ_003_3121		
<pre>with { QE2 disconnected } ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { QE1 indicates that QE2 is not reachable } }</pre>			
Pre-test conditions:	QE2 is disconnected from the Network B		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE2 indicate that Q1 is unreachable.	Yes	No
Observations:	Next receiving the echo request from QE2, QE4 will perform an ICMPv6 error message (1/0).		

Test Description			
Identifier:	TD_TRA_3122_01	Test Purpose:	TP_TRA_3122_01
Summary:	"A SIIT_Translator must translate ICMPv6 Destination Unreachable (port unreachable) messages to ICMPv4 Destination Unreachable (port unreachable) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3117, RQ_003_3122		
<pre> with { QE2 configured not to listen on UDP_port_80 } ensure that { when { QE1 sends a UDP_packet to QE2 on UDP_port_80 } then { QE1 indicates that the port is not reachable } } </pre>			
Pre-test conditions:	QE2 is configured not to listen on UDP_port_80.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an UDP_packet to QE1 on UDP_port_80		
2	Check: does QE1 receive an echo reply from QE2.	No	Yes
3	Check: does QE4 indicate Destination Unreachable (port Unreachable) to QE1.	Yes	No
Observations:	Next receiving the echo request from QE2, QE4 will perform an ICMPv6 error message (1/4).		

Test Description			
Identifier:	TD_TRA_3123_01	Test Purpose:	TP_TRA_3123_01
Summary:	"A SIIT_Translator must translate ICMPv6 Packet Too Big messages to ICMPv4 Destination Unreachable (don't fragment (DF) bit sent and fragmentation required) messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3123		
<pre> with { } ensure that { when { QE1 sends a packet length 1400 indicating that a response is requested to QE2 } then { QE1 indicates that fragmentation is needed } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request of length 1400 to QE2.		
2	Check: does QE1 receive an Echo Reply from QE2	No	Yes
3	Check: does QE1 indicates that a fragmentation is needed. (Due to packet too big)	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_3125_01	Test Purpose:	TP_TRA_3125_01
Summary:	"A SIIT_Translator must translate ICMPv6 Time Exceeded messages to ICMPv4 Time Exceeded messages"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3125		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested and indicating TTL of 4 to QE2 } then { QE1 indicates receipt of the response from QE2 } when { QE1 sends a packet indicating that a response is requested and indicating TTL of 3 to QE2 } then { QE1 indicates Time_Exceeded } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request with a TTL of 4 to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	Yes	No
3	Cause QE1 to send an Echo Request with a TTL of 3 to QE2		
4	Check: does QE1 receive an Echo Reply from QE2	No	Yes
5	Check: does QE1 indicates that time has been exceeded	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_3130_01	Test Purpose:	TP_TRA_3130_01
Summary:	"A SIIT_Translator must translate IPv6 packets with an IPv4-mapped destination to IPv4 packets"		
Roles:	SIIT_Translator	Configuration:	CF_TRA_02
References:	RQ_003_3130		
<pre> with { } ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { QE2 indicates receipt of the response from QE1 } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: does QE2 receive an Echo Reply from QE1	Yes	No
Observations:			

Group 3: RFC2766 - Network Address Translation - Protocol Translation (NAT-PT)

Group 3.1: DNS-ALG Operation

Test Description			
Identifier:	TD_TRA_6018_01	Test Purpose:	TP_TRA_6018_01
Summary:	"The DNS-ALG on the NAT-PT device SHALL modify DNS Queries for A records going into the V6 domain by replacing the string "IN-ADDR.ARPA" with the string "IP6.ARPA" in "Node address to Node name query requests"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_03
References:	RQ_003_6003, RQ_003_6018, RQ_003_6019		
with { EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG' and QE3 configured with at least 1 AAAA_record for QE1 } ensure that { when { QE2 sends a PTR_DNS_Query for QE1 to QE3 } then { QE2 indicates receipt of all the A_records for QE1 from QE3 } }			
Pre-test conditions:	QE3 is configured to have one AAAA Record concerning QE1		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send a PTR DNS query to concerning the address of QE1 to QE3		
2	Check: Does QE2 indicates the name of QE1 as a result of this query ?	YES	NO
Observations:			

Group 3.2: Traditional NAT-PT Operation

Test Description			
Identifier:	TD_TRA_6003_01	Test Purpose:	TP_TRA_6003_01
Summary:	"With Bi-Directional-NAT-PT implemented, the DNS-ALG MUST be capable of translating V6 addresses in DNS Queries and responses into their V4-address bindings, and vice versa, as DNS packets traverse between V6 and V4 realms"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_03
References:	RQ_003_6003		
with { EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG' and QE4 configured with 1 A_record for QE2 } ensure that { when { QE1 sends a packet indicating that a response is requested to the fully_qualified_domain_name of QE2 } then { EUT translates the needed DNS packets -- i.e. Change the query type from AAAA to A before QE1 receives the response from QE2 } }			
Pre-test conditions:	QE4 is configured with one A record for QE2		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the fully qualified domain name of QE2		
2	Check: does QE1 receive Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6003_02	Test Purpose:	TP_TRA_6003_02
Summary:	"With Bi-Directional-NAT-PT implemented, the DNS-ALG MUST be capable of translating V6 addresses in DNS Queries and responses into their V4-address bindings, and vice versa, as DNS packets traverse between V6 and V4 realms"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_03
References:	RQ_003_6003, RQ_003_6017, RQ_003_6020, RQ_003_6022, RQ_003_6023		
<pre> with { EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG' and QE3 configured with 1 AAAA_record for QE1 } ensure that { when { QE2 sends a packet indicating that a response is requested to the fully_qualified_domain_name of QE1 } then { EUT translates the needed DNS packets -- i.e. Change the query type from A to AAAA, the response type from AAAA to A, -- and V4 to or from V6 addresses before QE2 receives the response from QE1 } } </pre>			
Pre-test conditions:	QE3 is configured with one AAAA record for QE1.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to the fully qualified domain name of QE1		
2	Check: does QE2 receives Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6006_01	Test Purpose:	TP_TRA_6006_01
Summary:	"In basic NAT-PT implementation, if the outgoing packet is not a session initialization packet and the NAT-PT does not already have stored some state about the related session, the packet SHOULD be silently discarded"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6006		
<pre> with { } ensure that { when { QE1 sends a packet not indicating a session_initialisation and indicating that a response is requested to QE2 } then { EUT silently discards the packet } } </pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to initiate a TCP connection with QE2 (using telnet for example)		
2	Check: Is the connection established successfully ?	YES	NO
3	Restart EUT		
4	Wait for EUT to be ready		
5	Check: Is the connection between QE1 and QE2 still functional ?	NO	YES
Observations:			

Test Description			
Identifier:	TD_TRA_6007_01	Test Purpose:	TP_TRA_6007_01
Summary:	"In basic NAT-PT implementation, if the outgoing packet is a session initialization packet, the NAT-PT SHALL locally allocate an address from its pool of addresses"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6007, RQ_003_6008		
with { }			
ensure that { when { QE1 sends a IPv6_packet indicating a session_initialisation and indicating that a response is requested to QE2 } then { EUT translates the IPv6_packet to an IPv4_packet before QE1 receives the response from QE2 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6011_01	Test Purpose:	TP_TRA_6011_01
Summary:	"In basic NAT-PT implementation, the NAT-PT SHALL determine and then translate the returning packets belonging to the same session"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6011, RQ_003_6012		
with { }			
ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { EUT translates IPv6_packets to and from IPv4_packets before QE1 receives the response from QE2 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: does QE1 receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6014_01	Test Purpose:	TP_TRA_6014_01
Summary:	"With a NAPT-PT between IPv6 and IPv4 realms, on receipt of a return IPv4 packet, the NAPT-PT SHALL, on recognition of the TCP port, translated the packet back to V6"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6014		
with { }			
ensure that { when { QE1 sends a TCP_packet indicating that a response is requested to QE2 } then { EUT translates IPv6_packets to and from IPv4_packets before QE1 receives the response from QE2 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to establish a TCP connection with QE2 (using telnet for example)		
2	Check: Is the connection established successfully ?	YES	NO
Observations:			

Group 3.3: Protocol Translation Details

Test Description			
Identifier:	TD_TRA_6032_01	Test Purpose:	TP_TRA_6032_01
Summary:	"NAT-PT SHOULD translate all IP/ICMP headers from v4 to v6 in order to make end-to-end IPv4 to IPv6 communication possible. With the exception of the Source Address and Destination Address, the translation SHALL be as specified in		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6032, RQ_003_6035, RQ_003_6036, RQ_003_6037		
with { }			
ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { EUT translates the needed packets before QE2 receives the response from QE1 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: Does QE2 receive an Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6032_02	Test Purpose:	TP_TRA_6032_02
Summary:	"NAT-PT SHOULD translate all IP/ICMP headers from v4 to v6 in order to make end-to-end IPv4 to IPv6 communication possible. With the exception of the Source Address and Destination Address, the translation SHALL be as specified in		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_11
References:	RQ_003_6032, RQ_003_6035, RQ_003_6036, RQ_003_6037		
with { QE4 configured with no route to Network_B }			
ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { EUT translates the needed ICMP_packets before QE4 indicates that QE2 is not reachable to QE1 } }			
Pre-test conditions:	QE4 is configured with no route to Network B		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: Does QE1 receive an Echo Reply from QE2 ?	NO	YES
3	Check: Does QE1 indicates that QE2 is not reachable ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6033_01	Test Purpose:	TP_TRA_6033_01
Summary:	"NAT-PT SHOULD translate all IP/ICMP headers from v6 to v4 in order to make end-to-end IPv6 to IPv4 communication possible. With the exception of the Source Address and Destination Address, the translation SHALL be as specified in SIIT (RFC 2765 [5]). This test is for ping packets.		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6033, RQ_003_6038, RQ_003_6039, RQ_003_6040		
with { }			
ensure that { when { QE1 sends a packet indicating that a response is requested to QE2 } then { EUT translates the needed packets before QE1 receives the response from QE2 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: Does QE1 receive an Echo Reply from QE2 ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6033_02	Test Purpose:	TP_TRA_6033_02
Summary:	"NAT-PT SHOULD translate all IP/ICMP headers from v6 to v4 in order to make end-to-end IPv6 to IPv4 communication possible. With the exception of the Source Address and Destination Address, the translation SHALL be as specified in		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_11
References:	RQ_003_6032, RQ_003_6038, RQ_003_6039, RQ_003_6040		
with { QE3 configured with no route to Network_A } ensure that { when { QE2 sends a packet indicating that a response is requested to QE1 } then { EUT translates the needed ICMP_packets before QE3 indicates that QE1 is not reachable to QE2 } }			
Pre-test conditions:	QE3 is configured with no route to Network A		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE1		
2	Check: Does QE2 receive an Echo Reply from QE1 ?	NO	YES
3	Check: Does QE2 indicates that QE1 is not reachable ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6041_01	Test Purpose:	TP_TRA_6041_01
Summary:	"The UDP checksums, when is set to a non-zero value, SHOULD be recalculated to reflect the address change from v4 to v6"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6041		
with { } ensure that { when { QE2 sends a UDP_packet indicating that a response is requested to QE1 } then { EUT translates the needed packets -- among them, the UDP checksum before QE2 receives the response from QE1 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send a UDP packet to QE1 (using tracepath for example)		
2	Check: Does QE2 receive a correct response ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6042_01	Test Purpose:	TP_TRA_6042_01
Summary:	"The TCP checksum SHOULD be recalculated to reflect the address change from v4 to v6"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6042		
with { } ensure that { when { QE2 sends a TCP_packet indicating that a response is requested to QE1 } then { EUT translates the needed packets -- among them, the TCP checksum before QE2 receives the response from QE1 } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to establish a TCP connection with QE1 (using telnet for example)		
2	Check: Is the connection established successfully ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6046_01	Test Purpose:	TP_TRA_6046_01
Summary:	"The UDP checksums, when is set to a non-zero value, SHOULD be recalculated to reflect the address change from v6 to v4"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6046		
<pre>with { } ensure that { when { QE1 sends a UDP_packet indicating that a response is requested to QE2 } then { EUT translates the needed packets -- among them, the UDP checksum before QE2 receives the response from QE1} }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send a UDP packet to QE2 (using tracepath6 for example)		
2	Check: Does QE2 receive a correct response ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_6047_01	Test Purpose:	TP_TRA_6047_01
Summary:	"The TCP checksum SHOULD be recalculated to reflect the address change from v6 to v4"		
Roles:	NAT-PT_Router	Configuration:	CF_TRA_04
References:	RQ_003_6047		
<pre>with { } ensure that { when { QE1 sends a TCP_packet indicating that a response is requested to QE2 } then { EUT translates the needed packets -- among them, the TCP checksum before QE1 receives the response from QE2} }</pre>			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to establish a TCP connection with QE2 (using telnet for example)		
2	Check: is the connection established successfully ?	YES	NO
Observations:			

Group 4: RFC3056 - Connection of IPv6 Domains via IPv4 Clouds

Group 4.1: Address Selection

Test Description			
Identifier:	TD_TRA_0005_01	Test Purpose:	TP_TRA_0005_01
Summary:	"A 6to4 host having only one 6to4 address communicating with other 6to4 host having one 6to4 and one native addresses should use the 6to4 addresses"		
Roles:	6to4_Host	Configuration:	CF_TRA_05
References:	RQ_003_0005		
<pre> with { EUT configured with 1 6to4_address and EUT configured with no IPv6_native_address and QE1 configured with 1 6to4_address and QE1 configured with 1 IPv6_native_address and QE3 configured with 1 AAAA_record for the IPv6_native_address of QE1 and QE3 configured with 1 AAAA_record for the 6to4_address of QE1 } ensure that { when { EUT sends a packet indicating that a response is requested to the fully_qualified_domain_name of QE1 and EUT receives all the AAAA_records for QE1 } then { EUT sends the packet to the 6to4_address of QE1 before EUT receives the response from QE1 } } </pre>			
Pre-test conditions:	EUT is configured with one 6to4 address. EUT is configured with NO IPv6 native address. QE1 is configured with one 6to4 address. QE1 is configured with one IPv6 native address. QE3 is configured with one AAAA record for the IPv6 native address of QE1 QE3 is configured with one AAAA record for the 6to4 address of QE1.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause EUT to send an Echo Request to the fully qualified domain name of QE1		
2	Check: Does EUT receive an Echo Reply from QE1	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_0005_02	Test Purpose:	TP_TRA_0005_02
Summary:	"A 6to4 host having one 6to4 and one native addresses communicating with other 6to4 host having only one 6to4 address should use the 6to4 addresses"		
Roles:	6to4_Host	Configuration:	CF_TRA_06
References:	RQ_003_0005		
<pre> with { EUT configured with 1 6to4_address and EUT configured with 1 IPv6_native_address and QE2 configured with 1 6to4_address and QE2 configured with no IPv6_native_address } ensure that { when { EUT sends a packet indicating that a response is requested to the 6to4_address of QE2 } then { EUT sends the packet from its 6to4_address before EUT receives the response from QE2 } } </pre>			
Pre-test conditions:	EUT is configured with one 6to4 address. EUT is configured with one IPv6 native address. QE2 is configured with one 6to4 address. QE2 is configured with NO IPv6 native address. QE2 is unable to communicate with the IPv6 native address of EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause EUT to send an Echo Request to the 6to4 address of QE2		
2	Check: Does EUT receive an Echo Reply from QE2 ?	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_0007_01	Test Purpose:	TP_TRA_0007_01
Summary:	"A 6to4 host having one 6to4 and one native addresses communicating with other 6to4 host having one 6to4 and one native addresses should use both native or both 6to4 addresses"		
Roles:	6to4_Host	Configuration:	CF_TRA_06
References:	RQ_003_0007		
<pre> with { EUT configured with 1 6to4_address and EUT configured with 1 IPv6_native_address and QE2 configured with 1 6to4_address and QE2 configured with 1 IPv6_native_address } ensure that { when { EUT sends a packet indicating that a response is requested to the 6to4_address of QE2 } then { EUT sends the packet from its 6to4_address before EUT receives the response from QE2 } } </pre>			
Pre-test conditions:	EUT is configured with one 6to4 address. EUT is configured with one IPv6 native address. QE2 is configured with one 6to4 address. QE2 is configured with one IPv6 native address. QE2 is unable to communicate with the IPv6 native address of EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause EUT to send an Echo Request to the 6to4 address of QE2		
2	Check: Does EUT receive an Echo Reply from QE2	YES	NO
Observations:			

Test Description			
Identifier:	TD_TRA_0007_02	Test Purpose:	TP_TRA_0007_02
Summary:	"A 6to4 host having one 6to4 and one native addresses communication with other 6to4 host having one 6to4 and one native addresses should use both native or both 6to4 addresses"		
Roles:	6to4_Host	Configuration:	CF_TRA_12
References:	RQ_003_0007		
<pre> with { EUT configured with 1 6to4_address and EUT configured with 1 IPv6_native_address and QE2 configured with 1 6to4_address and QE2 configured with 1 IPv6_native_address } ensure that { when { EUT sends a packet indicating that a response is requested to the IPv6_native_address of QE2 } then { EUT sends the packet from its IPv6_native_address before EUT receives the response from QE2 } } </pre>			
Pre-test conditions:	EUT is configured with one 6to4 address. EUT is configured with one IPv6 native address. QE2 is configured with one 6to4 address. QE2 is configured with one IPv6 native address. QE2 is unable to communicate with the 6to4 address of EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause EUT to send an Echo Request to the IPv6 native address of QE2		
2	Check: Does EUT receive an Echo Reply from QE2	YES	NO
Observations:			

Group 4.2: Encapsulation in IPv4

Test Description			
Identifier:	TD_TRA_0011_01	Test Purpose:	TP_TRA_0011_01
Summary:	"The IPv4 packet body encapsulates the IPv6 header and payload"		
Roles:	6to4_Router	Configuration:	CF_TRA_06
References:	RQ_003_0011		
<pre> with { QE1 configured with 1 6to4_address and QE2 configured with 1 6to4_address } ensure that { when { QE1 sends a packet indicating that a response is requested to the 6to4_address of QE2 } then { EUT encapsulates the QE1 packet into an IPv4_packet before QE1 receives the response from QE2 } } </pre>			
Pre-test conditions:	QE1 is configured with one 6to4 address. QE2 is configured with one 6to4 address.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to QE2		
2	Check: Does QE1 receive an Echo Reply from QE2 ?	YES	NO
Observations:	QE5 is a pure IPv4 router and ensures that communication between EUT and QE6 is encapsulated into an IPv4 packet		

Group 4.3: Maximum Transmission Unit

Test Description			
Identifier:	TD_TRA_0012_01	Test Purpose:	TP_TRA_0012_01
Summary:	"The IPv4 "do not fragment" bit SHOULD NOT be set in the encapsulating IPv4 header"		
Roles:	6to4_Router	Configuration:	CF_TRA_06
References:	RQ_003_0012		
<pre> with { EUT configured not to perform IPv4_PMTU_Discovery and QE1 configured with 1 6to4_address and QE2 configured with 1 6to4_address and the PMTU of Network_D is lower than the IPv6_packets MTU } ensure that { when { QE1 sends an IPv6_packet indicating that a response is requested to the 6to4_address of QE2 } then { EUT encapsulates the QE1 IPv6_packet into an IPv4_packet containing do_not_fragment_bit indicating false before QE1 receives the response from QE2 } } </pre>			
Pre-test conditions:	MTU on Network D is set to 1300. EUT is configured not to perform IPv4 PMTU Discovery		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request of length 1400 to QE2		
2	Check: does QE1 receive a response from QE2 ?	YES	NO
3	Check: does QE1 indicates "Packet too Big"	NO	YES
Observations:			

Group 5: RFC3596 - DNS Extensions to Support IP Version 6

Test Description			
Identifier:	TD_TRA_5005_01	Test Purpose:	TP_TRA_5005_01
Summary:	"A DNSv6 server must return all AAAA records concerning a domain name when it receives a AAAA query"		
Roles:	DNSv6_Server	Configuration:	CF_TRA_07
References:	RQ_003_5005		
<pre>with { EUT configured with at least 2 AAAA_records for QE2 } ensure that { when { QE1 sends a AAAA_DNS_Query for QE2 to EUT } then { QE1 indicates receipt of all the AAAA_records for QE2 from EUT } }</pre>			
Pre-test conditions:	EUT configured with at least 2 AAAA_records for QE2.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send a DNS query for QE2 using a specific tool for interrogating DNS name Servers (dig)		
2	Check: does QE1 give information about all the AAAA_records concerning QE2	Yes	No
Observations:			

Group 6: RFC4213 - Basic Transition Mechanisms for IPv6 Hosts and Routers

Test Description			
Identifier:	TD_TRA_4004_01	Test Purpose:	TP_TRA_4004_01
Summary:	"An IPv6/IPv4 node must be able to deal with both A records and AAAA records"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_08
References:	RQ_003_4004		
<pre>with { QE1 configured with at least 1 AAAA_record for QE2 and QE1 configured with at least 1 A_record for QE2 and EUT configured to use QE1 as DNS_Server } ensure that { when { EUT is requested to send an IPv6_packet indicating that a response is requested to QE2 and EUT is requested to send an IPv4_packet indicating that a response is requested to QE2 } then { EUT indicates receipt of IPv6_response from QE2 and EUT indicates receipt of IPv4_response from QE2 } }</pre>			
Pre-test conditions:	QE1 is configured with at least 1 AAAA_record for QE2. QE1 is configured with at least 1 A_record for QE2. Lastly EUT is configured to use QE1 as DNS_Server.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause EUT to send an ICMPv6 Echo Request to QE2 using its hostname.		
2	Check: Does EUT receive an ICMPv6 Echo Reply from QE2.	Yes	No
3	Cause EUT to send an ICMPv4 Echo Request to QE2 using its hostname.		
4	Check: Does EUT receive an ICMPv4 Echo Reply from QE2.	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_4047_01	Test Purpose:	TP_TRA_4047_01
Summary:	"An IPv6/IPv4_Node must be able to decapsulate IPv6 in IPv4 packets"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_09
References:	RQ_003_4047		
<pre> with { EUT configured to establish a static_tunnel to network_A via QE1 and QE1 configured to establish a static_tunnel to network_B via EUT } ensure that { when { QE2 sends a packet indicating that a response is requested to QE3 } then { QE2 indicates receipt of the response from QE3 } } </pre>			
Pre-test conditions:	EUT is configured to establish a static_tunnel to network_A via QE1. QE1 is configured to establish a static_tunnel to network_B via EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE3		
2	Check: does QE2 receive an Echo Reply from QE3	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_4048_01	Test Purpose:	TP_TRA_4048_01
Summary:	"An IPv6/IPv4_Node acting as a decapsulator must check that the source of a received encapsulated packet is the address of the encapsulator"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_09
References:	RQ_003_4048		
<pre> with { EUT configured to establish a static_tunnel to network_A via QE4 and QE1 configured to establish a static_tunnel to network_B via EUT } ensure that { when { QE2 sends a packet indicating that a response is requested to QE3 } then { QE2 receives no response from QE3 } } </pre>			
Pre-test conditions:	EUT is configured to establish a static_tunnel to network_A via QE4. QE1 is configured to establish a static_tunnel to network_B via EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request to QE3		
2	Check: does QE2 receive an Echo Reply from QE3.	No	Yes
Observations:			

Test Description			
Identifier:	TD_TRA_4055_01	Test Purpose:	TP_TRA_4055_01
Summary:	"An IPv6/IPv4_Node acting as a decapsulator must be able to reassemble an IPv4 packet of size 1500"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_09
References:	RQ_003_4055, RQ_003_4057		
<pre> with { EUT configured to establish a static_tunnel to network_A via QE1 and QE1 configured to establish a static_tunnel to network_B via EUT } ensure that { when { QE2 sends a packet of length 1500 indicating that a response is requested to QE3 } then { QE2 indicates receipt of the response from QE3 } } </pre>			
Pre-test conditions:	EUT is configured to establish a static_tunnel to network_A via QE1. QE1 is configured to establish a static_tunnel to network_B via EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request of length 1500 to QE3		
2	Check: does QE2 receive an Echo Reply from QE3	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_4064_01	Test Purpose:	TP_TRA_4064_01
Summary:	"An IPv6/IPv4_Node acting as a decapsulator must be decrement the hop limit of forwarded packets by one"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_09
References:	RQ_003_4064		
<pre> with { EUT configured to establish a static_tunnel to network_A via QE1 and QE1 configured to establish a static_tunnel to network_B via EUT } ensure that { when { QE2 sends a packet indicating that a response is requested and indicating TTL of 3 to QE3 } then { QE2 indicates receipt of the response from QE3 } when { QE2 sends a packet indicating that a response is requested and indicating TTL of 2 to QE3 } then { QE2 receives no response from QE3 } } </pre>			
Pre-test conditions:	EUT is configured to establish a static_tunnel to network_A via QE1. QE1 is configured to establish a static_tunnel to network_B via EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE2 to send an Echo Request indicating TTL of 3 to QE3.		
2	Check: does QE2 receive an Echo Reply from QE3	Yes	No
3	Cause QE2 to send an Echo Request indicating TTL of 2 to QE3.		
4	Check: does QE2 receive an Echo Reply from QE2.	No	Yes
Observations:			

Test Description			
Identifier:	TD_TRA_4071_01	Test Purpose:	TP_TRA_4071_01
Summary:	"An IPv6/IPv4_Node builds a link-local address for its tunnel interface using the interface IPv4 address"		
Roles:	IPv6/IPv4_Node	Configuration:	CF_TRA_09
References:	RQ_003_4071, RQ_003_4073, RQ_003_4074		
<pre> with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the link_local_address of EUT } then { QE1 indicates receipt of the response from EUT } } </pre>			
Pre-test conditions:	EUT is configured to establish a static_tunnel to network_A via QE1. QE1 is configured to establish a static_tunnel to network_B via EUT.		
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the link-local address of EUT.		
2	Check: does QE1 receive an Echo Reply from EUT.	Yes	No
Observations:			

Group 7: RFC 4214 - Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)

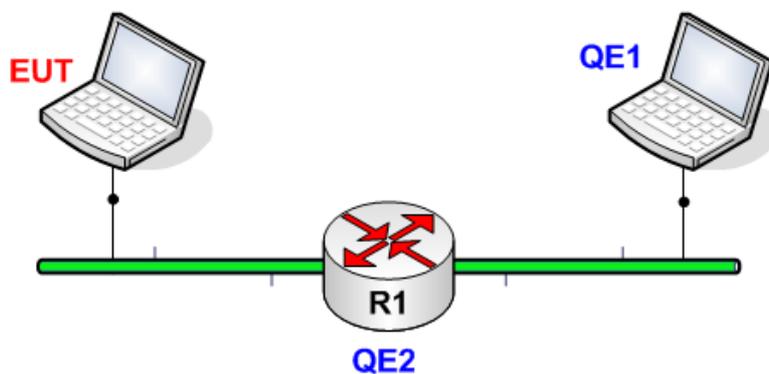
Test Description			
Identifier:	TD_TRA_2009_01	Test Purpose:	TP_TRA_2009_01
Summary:	"An ISATAP_Node builds a link-local address for its ISATAP interface using IPv4 address from its locator set"		
Roles:	ISATAP_Node	Configuration:	CF_TRA_10
References:	RQ_003_2009		
with { } ensure that { when { QE1 sends a packet indicating that a response is requested to the ISATAP_link_local_address of EUT } then { QE1 indicates receipt of the response from EUT } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send an Echo Request to the ISATAP_link_local_address of EUT.		
2	Check: does QE1 receive an Echo Reply from EUT.	Yes	No
Observations:			

Test Description			
Identifier:	TD_TRA_2018_01	Test Purpose:	TP_TRA_2018_01
Summary:	"An advertising ISATAP_router only send unicast router advertisements"		
Roles:	ISATAP_Node	Configuration:	CF_TRA_10
References:	RQ_003_2018		
with { } ensure that { when { QE1 sends a Router_Solicitation to EUT } then { QE1 indicates receipt of a Router_Advertisement from EUT and QE2 indicates no receipt of a Router_Advertisement from EUT } }			
Pre-test conditions:			
Step	Test Sequence	Verdict	
		Pass	Fail
1	Cause QE1 to send a Router_Solicitation to EUT		
2	Check: does QE1 receive a Router_Advertisement from EUT.	Yes	No
3	Check: does QE2 receive a Router_Advertisement from EUT.	No	Yes
Observations:			

Annex A (informative): Interoperability Testing Configurations

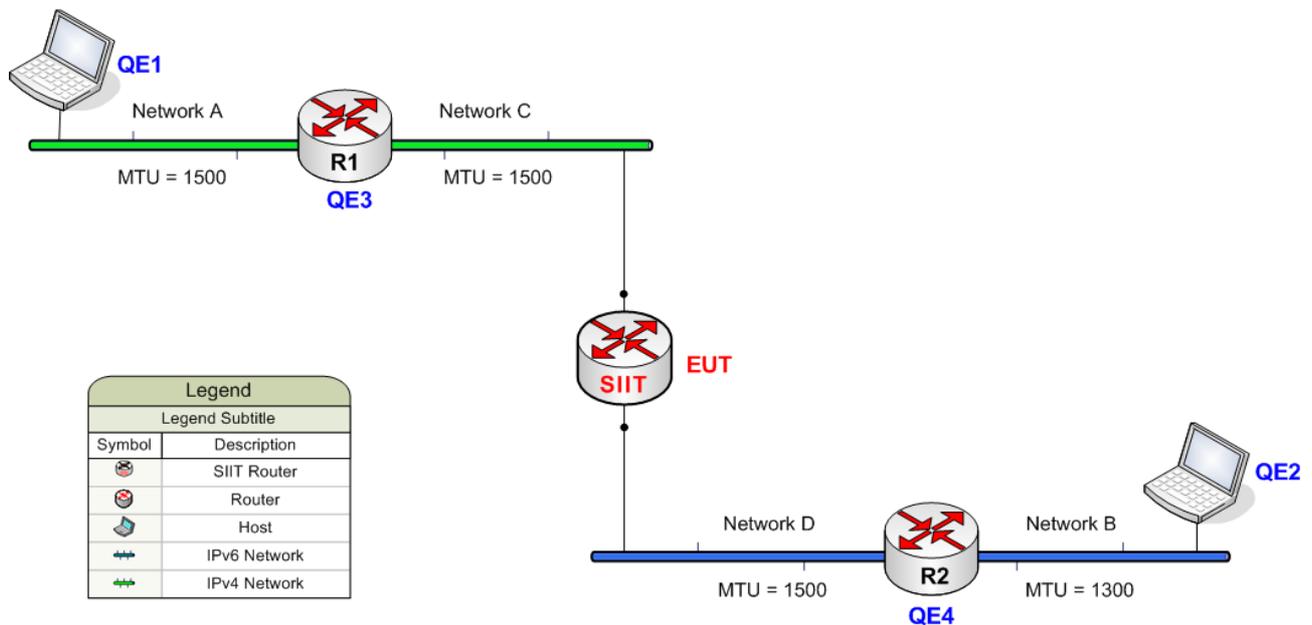
The following architectural configurations are referenced in the IPv4 to IPv6 Transitioning Interoperability Test Descriptions specified in the present document. They are intended to give a general rather than specific view of the possible roles of the EUT and its associated QE(s) and the relationships between them.

CF_TRA_01



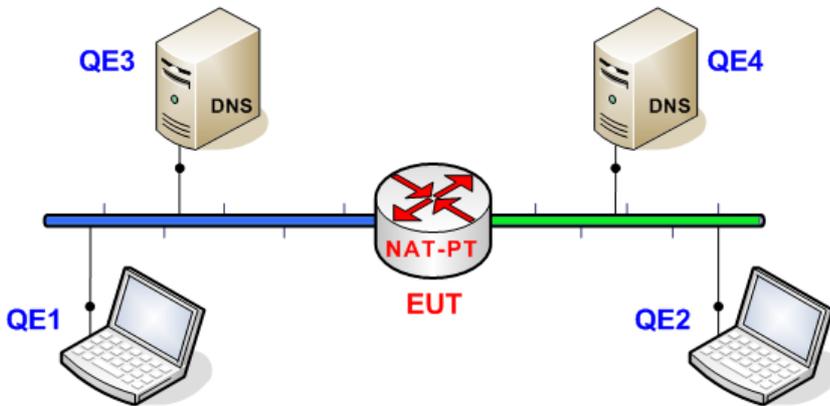
Legend	
Legend Subtitle	
Symbol	Description
	IPv4 Multicast Router
	6over4 Host
	IPv4 Network

CF_TRA_02



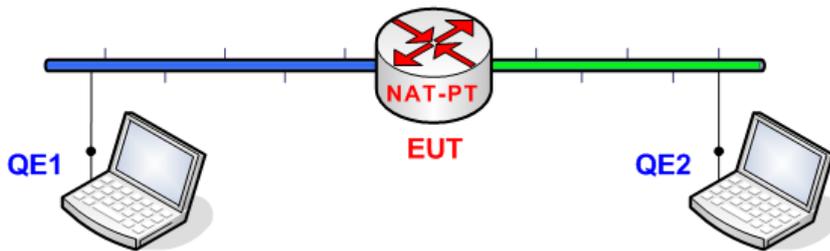
Legend	
Legend Subtitle	
Symbol	Description
	SIIT Router
	Router
	Host
	IPv6 Network
	IPv4 Network

CF_TRA_03



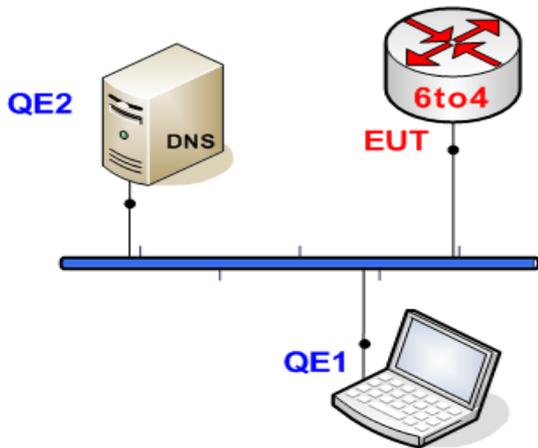
Legend	
Legend Subtitle	
Symbol	Description
	NAT-PT Router
	DNS Server
	Host
	IPv6 Network
	IPv4 Network

CF_TRA_04



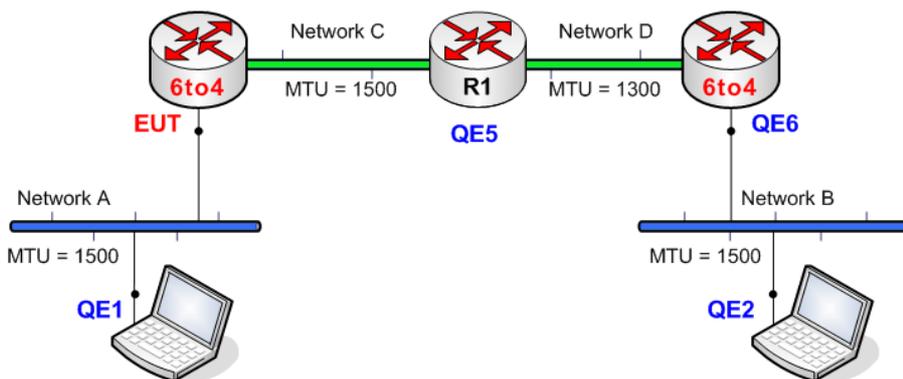
Legend	
Legend Subtitle	
Symbol	Description
	NAT-PT Router
	DNS Server
	IPv6 Network
	IPv4 Network

CF_TRA_05



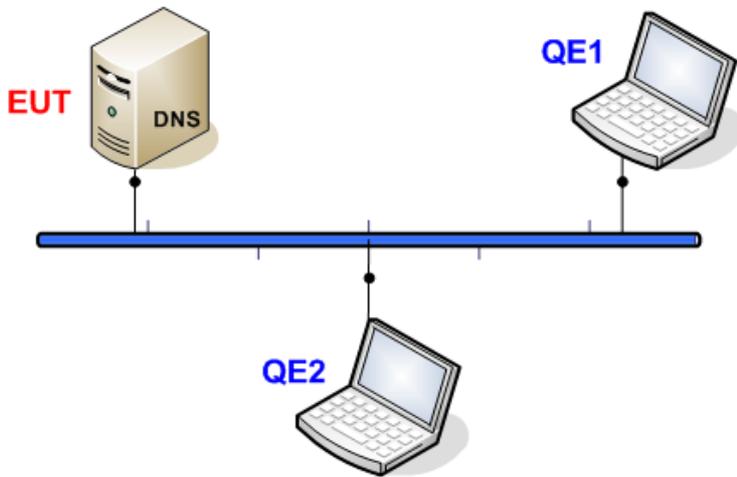
Legend	
Legend Subtitle	
Symbol	Description
	6to4 Router
	DNS Server
	Host
	IPv6 Network

CF_TRA_06



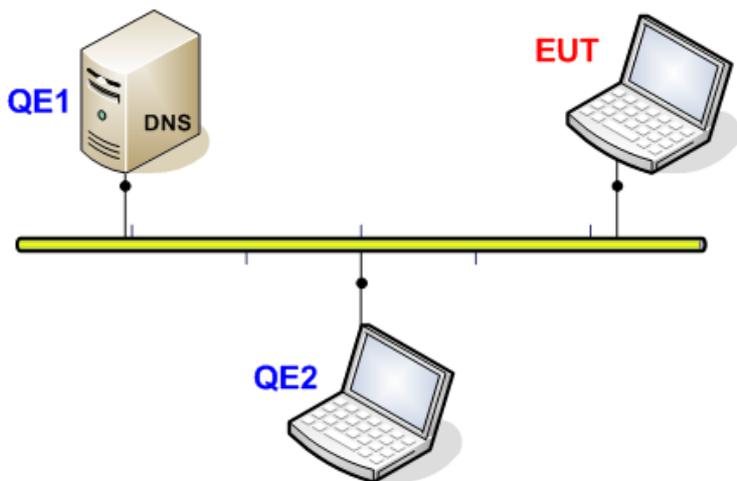
Legend	
Legend Subtitle	
Symbol	Description
	6to4 Router
	Router
	Host
	IPv6 Network
	IPv4 Network

CF_TRA_07



Legend	
Legend Subtitle	
Symbol	Description
	IPv6 DNS Server
	IPv6 Host
	IPv6 Network

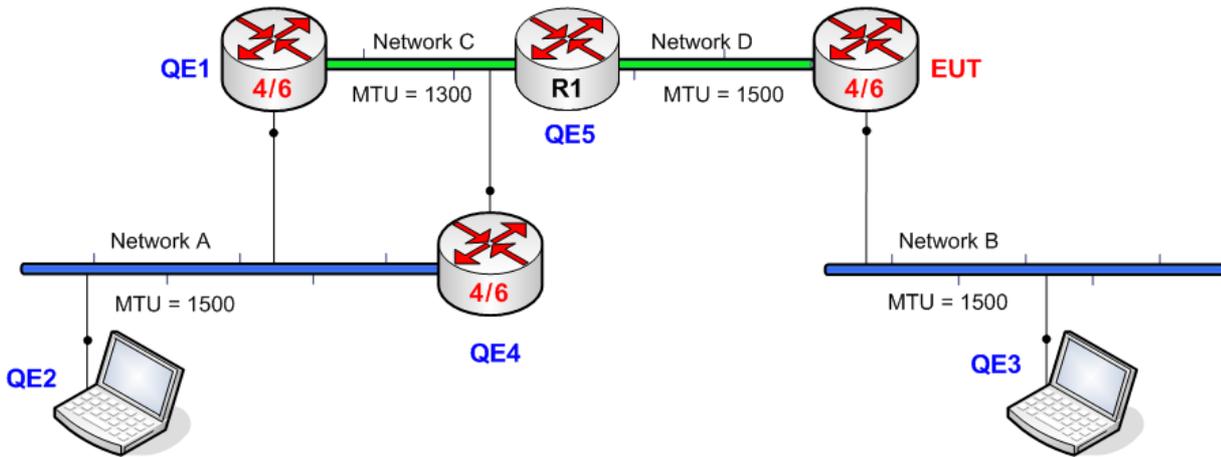
CF_TRA_08



Legend	
Legend Subtitle	
Symbol	Description
	IPv4/IPv6 DNS Server
	IPv4/IPv6 Host
	IPv4/IPv6 Network

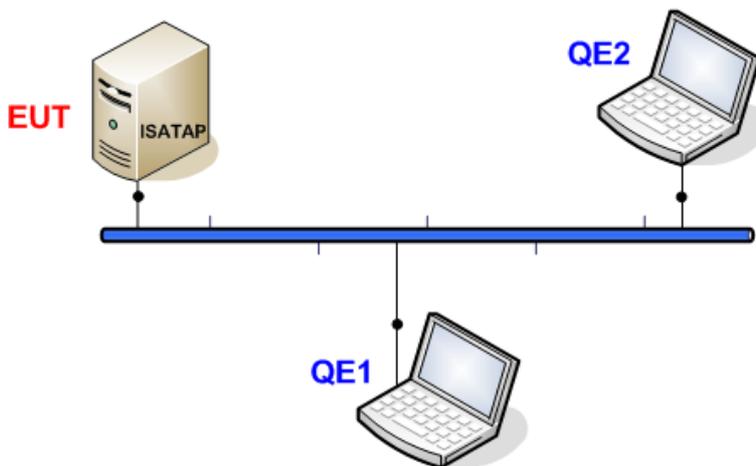
CF_TRA_09

Legend	
Legend Subtitle	
Symbol	Description
	Dual Stack Router
	Router
	Host
	IPv6 Network
	IPv4 Network



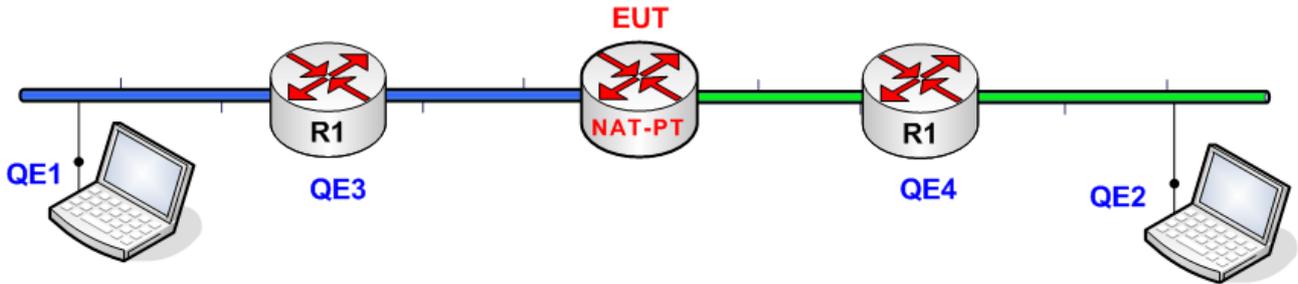
CF_TRA_10

Legend	
Legend Subtitle	
Symbol	Description
	ISATAP Node
	Host
	IPv6 Network

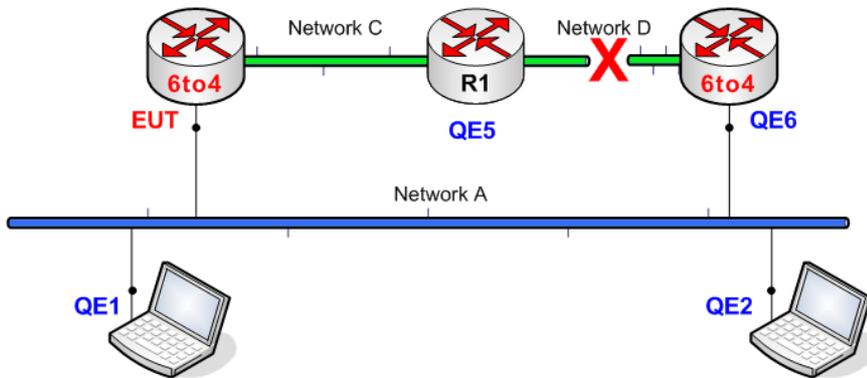


CF_TRA_11

Legend	
Legend Subtitle	
Symbol	Description
	NAT-PT Router
	Router
	Host
	IPv6 Network
	IPv4 Network

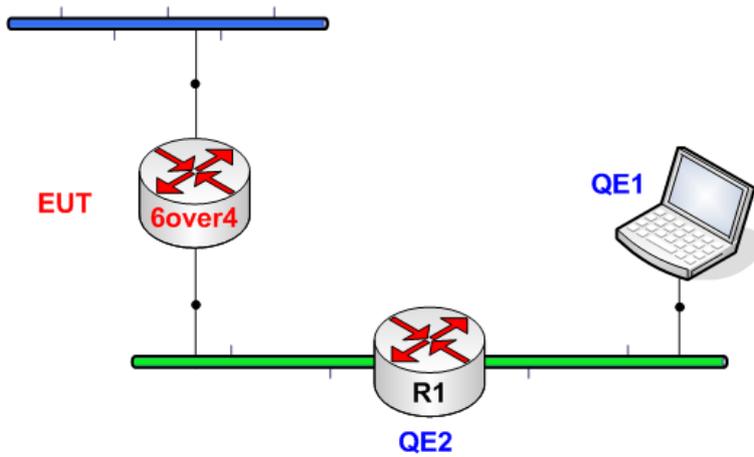


CF_TRA_12



Legend	
Legend Subtitle	
Symbol	Description
	6to4 Router
	Router
	Host
	IPv6 Network
	IPv4 Network

CF_TRA_13



Legend	
Legend Subtitle	
Symbol	Description
	6over4 Router
	IPv4 Multicast Router
	6over4 Host
	IPv6 Network
	IPv4 Network

Annex B (informative): IPv6 Interoperability Test Purposes

The Test Suite Structure is based on the IPv4 to IPv6 Transitioning RFCs and the IPv6 Requirements Catalogue nodes. It is defined by the groups within the following TPLan specification of test purposes. The numbering is not contiguous so that new TPs can be added at a later date without the need to completely renumber the TSS groups.

```
-- *****
TSS      : TRA
Title    : 'IPv6 TRANSITION Test Purposes'
Version  : 1.0
Date     : 13.04.2007
Author   : 'STF276 - Task 4'
-- *****

--***Cross references***

-- Requirements
xref RQ_003 { RFC2529,
              RFC2765,
              RFC2766,
              RFC3056,
              RFC3596,
              RFC4213,
              RFC4214 }

-- Configurations
xref CF_TRA_00 {Configs_IOP_TRANS.pdf}
xref CF_TRA_01 {Configs_IOP_TRANS.pdf}
xref CF_TRA_02 {Configs_IOP_TRANS.pdf}
xref CF_TRA_03 {Configs_IOP_TRANS.pdf}

--***Definitions***

-- Primary Configuration Entities
def entity EUT
def entity QE1
def entity QE2
def entity QE3
def entity QE4

---- Supplementary entities
def entity DNS
def entity DNS_Server
def entity Network_A
def entity Network_B
def entity Network_D
def entity static_tunnel
def entity PMTU
def entity route
def entity segments
def entity port
def entity UDP_port_80
def entity session_initialisation

-- Messages
def event packets { packet }
def event IPv4_packets { IPv4_packet }
def event IPv6_packets { IPv6_packet }
def event ICMP_packets
def event IPv4_Translated_packets
def event IPv4_Mapped_packets
def event UDP_packet
def event TCP_packet
def event Router_Solicitation
def event Router_Advertisement
def event Echo_Reply
def event Echo_Request
def event response
def event IPv4_response
def event IPv6_response
```

```

def event AAAA_DNS_Query
def event PTR_DNS_Query
def event IPv4_PMTU_Discovery

-- Keywords - Preconditions
def word configured
def word disconnected
def word listen
def word use

-- Values
def value link_local_address
def value IPv6_native_address
def value 6to4_address
def value ISATAP_link_local_address
def value all_nodes_multicast_address
def value all_routers_multicast_address
def value solicited_node_multicast_address
def value do_not_fragment_bit
def value TTL
def value length
def value MTU
def value A_records { A_record }
def value AAAA_records { AAAA_record }
def value fully_qualified_domain_name
def value false

-- Keywords - Actions
def word establish
def word requested
def context {is ~requested to}
def word send
def word translates
def word block
def word perform

-- Keywords - Responses
def word silently
def word discards
def word encapsulates
def word indicates
def word receipt
def context {~indicates ~receipt}
def context {sends [no] ~response}
def context {receipt of [the] ~response}
def context {~silently ~discards}
def word reachable
def word communication
def word administratively
def word prohibited
def context {~administratively ~prohibited}
def word fragmentation
def word needed
def context {~fragmentation is needed}
def word Time_Exceeded

-- Keywords - Glue
def word at
def word for
def word lower
def word least
def word than
def word all
def word via
def word on
def word into
def word its

-----
--* RFC2529 - Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
-----

Group 1 'RFC2529 - Transmission of IPv6 over IPv4 Domains
        without Explicit Tunnels'

```

TP id : TP_TRA_1009_01

```

summary : 'A 6over4 node builds a link-local address for an IPv4 virtual
          interface using the interface IPv4 address'
RQ ref   : RQ_003_1009, RQ_003_1012, RQ_003_1016
Role     : 6over4_node
config   : CF_TRA_01
TD ref   : TD_TRA_1009_01
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
         to the link_local_address of EUT }
  then { QE1 indicates receipt of the response from EUT }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id    : TP_TRA_1027_01
summary  : 'A 6over4 router must join the all-nodes multicast address'
RQ ref   : RQ_003_1027
Role     : 6over4_router
config   : CF_TRA_13
TD ref   : TD_TRA_1027_01
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
         to the all_nodes_multicast_address }
  then { QE1 indicates receipt of the response from EUT }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id    : TP_TRA_1027_02
summary  : 'A 6over4 router must join the all-routers multicast address'
RQ ref   : RQ_003_1027
Role     : 6over4_router
config   : CF_TRA_13
TD ref   : TD_TRA_1027_02
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
         to the all_routers_multicast_address }
  then { QE1 indicates receipt of the response from EUT }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id    : TP_TRA_1027_03
summary  : 'A 6over4 router must join the solicited-node multicast address
          corresponding to its IPv6 address'
RQ ref   : RQ_003_1027
Role     : 6over4_router
config   : CF_TRA_13
TD ref   : TD_TRA_1027_03
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
         to the solicited_node_multicast_address of EUT }
  then { QE1 indicates receipt of the response from EUT }
}

```

End Group 1

```
--*****--
```

```
--* RFC2765 - Stateless IP/ICMP Translation Algorithm (SIIT)
```

```
--*****--
```

Group 2 'RFC2765 - Stateless IP/ICMP Translation Algorithm (SIIT)'

Group 2.1 'Translating from IPv4 to IPv6'

```

TP id    : TP_TRA_3003_01
summary  : 'When the IPv4 Sender does not perform PMTU discovery, the translator
          shall fragment the IPv4 packet so that it fits in 1280 bytes IPv6'
RQ ref   : RQ_003_3003

```

```

Role      : SIIT_Translator
config    : CF_TRA_02
TD ref    : TD_TRA_3003_01
with {
    EUT configured not to use PMTU on Network_A
}
ensure that {
    when { QE1 sends a packet of length 1500
           indicating that a response is requested to QE2 }
    then { QE1 indicates receipt of the response from QE2 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id     : TP_TRA_3014_01
summary   : 'The SIIT Translator must copy the TTL value from IPv4 header s to the
           Hop Limit in the resulting IPv6 header s. During translation, the
           translator shall decrement the TTL value or IPv6 Hop Limit'
RQ ref    : RQ_003_3014, RQ_003_3015
Role      : SIIT_Translator
config    : CF_TRA_02
TD ref    : TD_TRA_3014_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 4
           to QE2 }
    then { QE1 indicates receipt of the response from QE2 }
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 3
           to QE2 }
    then { QE1 receives no response from QE2 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id     : TP_TRA_3016_01
summary   : 'As part of forwarding the packet, if the translator has decremented the
           IPV4 TTL (before translation) it shall not decrement the IPv6 Hop Limit
           (After translation). The SIIT_Translator must not decrement 2 times.'
RQ ref    : RQ_003_3016
Role      : SIIT_Translator
config    : CF_TRA_02
TD ref    : TD_TRA_3016_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 3
           to QE2 }
    then { QE1 receives no response from QE2 }
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 4
           to QE2 }
    then { QE1 indicates receipt of the response from QE2 }
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 5
           to QE2 }
    then { QE1 indicates receipt of the response from QE2 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id     : TP_TRA_3017_01
summary   : 'As part of decrementing the TTL value, the SIIT_Translator needs to check for zero
           and if present, send the ICMPv4 ttl exceeded error'
RQ ref    : RQ_003_3017
Role      : SIIT_Translator
config    : CF_TRA_02
TD ref    : TD_TRA_3017_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
           and indicating TTL of 4
           to QE2 }
    then { QE1 indicates receipt of the response from QE2 }
    when { QE1 sends a packet indicating that a response is requested
}

```

```

        and indicating TTL of 2
        to QE2 }
    then { QE1 indicates Time_Exceeded }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3018_01
summary : 'When translating IPv4 to IPv6, the IPv6 source Address
          and Destination field shall be constructed with the low-order 32bits
          (IPv4 Source or Destination) and the high-order 96bits (IPv4-mapped prefix
          or IPv4-translated prefix respectively)'
RQ ref  : RQ_003_3018, RQ_003_3019
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3018_01
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
        to QE2 }
  then { QE1 indicates receipt of the response }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3037_01
summary : 'A SIIT_Translator must be able to translate ICMPv4 Echo Requests
          to ICMPv6 Echo Requests, by changing the type and adjusting the
          checksum'
RQ ref  : RQ_003_3037, RQ_003_3034, RQ_003_3038
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3037_01
with {
}
ensure that {
  when { QE1 sends an Echo_Request to QE2 }
  then { QE1 indicates receipt of an Echo_Reply from QE2 }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3039_01
summary : 'A SIIT_Translator must be able to translate ICMPv4 Echo Replies
          to ICMPv6 Echo Replies, by changing the type and adjusting the
          checksum'
RQ ref  : RQ_003_3039, RQ_003_3034, RQ_003_3040
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3039_01
with {
}
ensure that {
  when { QE2 sends an Echo_Request to QE1 }
  then { QE2 indicates receipt of an Echo_Reply from QE1 }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3051_01
summary : 'A SIIT_Translator must translate ICMPv4 Destination Unreachable
          (net unreachable) messages to ICMPv6 Destination Unreachable
          (no route to destination) messages'
RQ ref  : RQ_003_3051
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3051_01
with {
  QE3 configured with no route for IPv4_mapped_packets
}
ensure that {
  when { QE2 sends a packet indicating that a response is requested
        to QE1 }
  then { QE2 indicates that QE1 is not reachable }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3053_01
summary : 'A SIIT_Translator must translate ICMPv4 Destination Unreachable
          (port unreachable) messages to ICMPv6 Destination Unreachable
          (port unreachable) messages'
RQ ref  : RQ_003_3053
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3053_01
with {
    QE1 configured not to listen on UDP_port_80
}
ensure that {
    when { QE2 sends a UDP_packet to QE1 on UDP_port_80 }
    then { QE2 indicates that the port is not reachable }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3057_01
summary : 'A SIIT_Translator must translate ICMPv4 Destination Unreachable
          (administratively prohibited) messages to ICMPv6 Destination
          Unreachable (administratively prohibited) messages'
RQ ref  : RQ_003_3057
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3057_01
with {
    QE3 configured to block packets from QE2
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
          to QE1 }
    then { QE2 indicates that communication with QE1
          is administratively prohibited }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3059_01
summary : 'A SIIT_Translator must translate ICMPv4 Time Exceeded messages
          to ICMPv6 Time Exceeded messages'
RQ ref  : RQ_003_3059, RQ_003_3060
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3059_01
with {
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
          and indicating TTL of 4
          to QE1 }
    then { QE2 indicates receipt of the response from QE1 }
    when { QE2 sends a packet indicating that a response is requested
          and indicating TTL of 3
          to QE1 }
    then { QE2 indicates Time_Exceeded }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3063_01
summary : 'A SIIT_Translator must translate IPv4 packets with an IPv4 address compatible
          with the pool of IPv4_Translated Address of IPv6 Nodes'
RQ ref  : RQ_003_3063
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3063_01
with {
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
          to QE1 }
    then { QE2 indicates receipt of the response }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_3064_01
summary : 'A SIIT_Translator must translate ICMPv4 Destination Unreachable
          (host unreachable) messages to ICMPv6 Destination Unreachable

```

(no route to destination) messages'

```
RQ ref : RQ_003_3064
Role   : SIIT_Translator
config : CF_TRA_02
TD ref : TD_TRA_3064_01
with {
    QE1 disconnected
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
           to QE1 }
    then { QE2 indicates that QE1 is not reachable }
}
```

End Group 2.1

Group 2.2 'Translating from IPv6 to IPv4'

```
TP id : TP_TRA_3080_01
summary : 'The SIIT_Translator must copy the Hop Limit from IPv6 header s to the
          TTL value in the resulting IPv4 header s. During translation, the
          translator shall decrement the IPv4 TTL value or IPv6 Hop Limit'
RQ ref : RQ_003_3080, RQ_003_3081
Role   : SIIT_Translator
config : CF_TRA_02
TD ref : TD_TRA_3080_01
with {
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
           and indicating TTL of 4
           to QE1 }
    then { QE2 indicates receipt of the response from QE1 }
    when { QE2 sends a packet indicating that a response is requested
           and indicating TTL of 3
           to QE1 }
    then { QE2 receives no response from QE1 }
}
```

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```
TP id : TP_TRA_3082_01
summary : 'As part of forwarding the packet, if the translator has decremented the
          IPv6 Hop Limit (before translation) it shall not decrement the IPv4 TTL
          (After translation). The SIIT_Translator must not decrement 2 times.'
RQ ref : RQ_003_3082
Role   : SIIT_Translator
config : CF_TRA_02
TD ref : TD_TRA_3082_01
with {
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
           and indicating TTL of 3
           to QE1 }
    then { QE2 receives no response from QE1 }
    when { QE2 sends a packet indicating that a response is requested
           and indicating TTL of 4
           to QE1 }
    then { QE2 indicates receipt of the response from QE1 }
    when { QE2 sends a packet indicating that a response is requested
           and indicating TTL of 5
           to QE1 }
    then { QE2 indicates receipt of the response from QE1 }
}
```

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```
TP id : TP_TRA_3083_01
summary : 'As part of decrementing the TTL value, the SIIT_Translator needs to check for zero
          and if present, send the ICMPv6 ttl exceeded error'
RQ ref : RQ_003_3083
Role   : SIIT_Translator
config : CF_TRA_02
TD ref : TD_TRA_3083_01
with {
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
```

```

        and indicating TTL of 4
        to QE1 }
    then { QE2 indicates receipt of the response from QE1 }
    when { QE2 sends a packet indicating that a response is requested
          and indicating TTL of 2
          to QE1 }
    then { QE2 indicates Time_Exceeded }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3086_01
summary : 'When translating Ipv6 to Ipv4, the resulting IPv4 Source Address
          (or Destination Address respectively) shall be the low-order 32 bits
          of the IPv6 Source Address (or the IPv6 Destination Address respectively)'
RQ ref  : RQ_003_3086, RQ_003_3087
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3086_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
          to QE2 }
    then { QE1 indicates receipt of the response }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3093_01
summary : 'A SIIT_Translator must not translate packets with a non-zero Segments Left Field
          in the Routing header'
RQ ref  : RQ_003_3093
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3093_01
with {
}
ensure that {
    when { QE2 sends a packet with 0 route segments
          indicating that a response is requested
          to QE1 }
    then { QE2 indicates receipt of the response }
    when { QE2 sends a packet with 2 route segments
          indicating that a response is requested
          to QE1 }
    then { QE2 receives no response from QE1 }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3104_01
summary : 'A SIIT_Translator must be able to translate ICMPv6 Echo Requests
          to ICMPv4 Echo Requests, by changing the type and adjusting the
          checksum'
RQ ref  : RQ_003_3104, RQ_003_3101, RQ_003_3105
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3104_01
with {
}
ensure that {
    when { QE2 sends an Echo_Request to QE1 }
    then { QE2 indicates receipt of an Echo_Reply from QE1 }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3106_01
summary : 'A SIIT_Translator must be able to translate ICMPv6 Echo Replies
          to ICMPv4 Echo Replies, by changing the type and adjusting the
          checksum'
RQ ref  : RQ_003_3106, RQ_003_3101, RQ_003_3107
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3106_01
with {
}

```

```

ensure that {
  when { QE1 sends an Echo_Request to QE2 }
  then { QE1 indicates receipt of an Echo_Reply from QE2 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_3118_01
summary : 'A SIIT_Translator must translate ICMPv6 Destination Unreachable
          (no route to destination) messages to ICMPv4 Destination Unreachable
          (host unreachable) messages'
RQ ref  : RQ_003_3118, RQ_003_3117
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3118_01
with {   QE4 configured with no route for IPv4_Translated_packets
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
        to QE2 }
  then { QE1 indicates that QE2 is not reachable }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_3119_01
summary : 'A SIIT_Translator must translate ICMPv6 Destination Unreachable
          (administratively prohibited) messages to ICMPv4 Destination
          Unreachable (administratively prohibited) messages'
RQ ref  : RQ_003_3119, RQ_003_3117
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3119_01
with {   QE4 configured to block packets from QE1
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
        to QE2 }
  then { QE1 indicates that communication with QE2
        is administratively prohibited }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_3121_01
summary : 'A SIIT_Translator must translate ICMPv6 Destination Unreachable
          (address unreachable) messages to ICMPv4 Destination Unreachable
          (host unreachable) messages'
RQ ref  : RQ_003_3121, RQ_003_3117
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3121_01
with {   QE2 disconnected
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
        to QE2 }
  then { QE1 indicates that QE2 is not reachable }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_3122_01
summary : 'A SIIT_Translator must translate ICMPv6 Destination Unreachable
          (port unreachable) messages to ICMPv4 Destination Unreachable
          (port unreachable) messages'
RQ ref  : RQ_003_3122, RQ_003_3117
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3122_01
with {   QE2 configured not to listen on UDP_port_80
}
ensure that {
  when { QE1 sends a UDP_packet to QE2 on UDP_port_80 }
  then { QE1 indicates that the port is not reachable }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```

```

TP id   : TP_TRA_3123_01
summary : 'A SIIT_Translator must translate ICMPv6 Packet Too Big messages
          to ICMPv4 Destination Unreachable (dont fragment (DF) bit sent
          and fragmentation required) messages'
RQ ref  : RQ_003_3123
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3123_01
with {
}
ensure that {
  when { QE1 sends a packet length 1400
         indicating that a response is requested
         to QE2 }
  then { QE1 indicates that fragmentation is needed }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3125_01
summary : 'A SIIT_Translator must translate ICMPv6 Time Exceeded messages
          to ICMPv4 Time Exceeded messages'
RQ ref  : RQ_003_3125
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3125_01
with {
}
ensure that {
  when { QE1 sends a packet indicating that a response is requested
         and indicating TTL of 4
         to QE2 }
  then { QE1 indicates receipt of the response from QE2 }
  when { QE1 sends a packet indicating that a response is requested
         and indicating TTL of 3
         to QE2 }
  then { QE1 indicates Time_Exceeded }
}

```

```
--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--
```

```

TP id   : TP_TRA_3130_01
summary : 'A SIIT_Translator must translate IPv6 packets with an IPv4-mapped
          destination to IPv4 packets'
RQ ref  : RQ_003_3130
Role    : SIIT_Translator
config  : CF_TRA_02
TD ref  : TD_TRA_3130_01
with {
}
ensure that {
  when { QE2 sends a packet indicating that a response is requested
         to QE1 }
  then { QE2 indicates receipt of the response from QE1 }
}

```

End Group 2.2

End Group 2

```

-----
--* RFC2766 - Network Address Translation - Protocol Translation (NAT-PT)
-----

```

Group 3 'RFC2766 - Network Address Translation - Protocol Translation (NAT-PT)'

Group 3.1 'DNS-ALG Operation'

```

TP id   : TP_TRA_6003_01
summary : 'With Bi-Directional-NAT-PT implemented, the DNS-ALG MUST be capable of translating V6
addresses
          in DNS Queries and responses into their V4-address bindings, and vice versa, as DNS
packets
          traverse between V6 and V4 realms'
RQ ref  : RQ_003_6003

```

```

Role      : NAT-PT_router
config    : CF_TRA_03
TD ref    : TD_TRA_6003_01
with {
    EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG'
    and QE4 configured with 1 A_record for QE2
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
           to the fully_qualified_domain_name of QE2 }
    then { EUT translates the needed DNS packets -- i.e. Change the query type from AAAA to A
           before QE1 receives the response from QE2 }
}

--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--

TP id     : TP_TRA_6003_02
summary   : 'With Bi-Directional-NAT-PT implemented, the DNS-ALG MUST be capable of translating V6
addresses
           in DNS Queries and responses into their V4-address bindings, and vice versa, as DNS
           packets
           traverse between V6 and V4 realms'
RQ ref    : RQ_003_6003, RQ_003_6017, RQ_003_6020, RQ_003_6022, RQ_003_6023
Role      : NAT-PT_router
config    : CF_TRA_03
TD ref    : TD_TRA_6003_02
with {
    EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG'
    and QE3 configured with 1 AAAA_record for QE1
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
           to the fully_qualified_domain_name of QE1 }
    then { EUT translates the needed DNS packets
           -- i.e. Change the query type from A to AAAA, the response type from AAAA to A,
           -- and V4 to or from V6 addresses
           before QE2 receives the response from QE1 }
}

--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--

TP id     : TP_TRA_6018_01
summary   : 'The DNS-ALG on the NAT-PT device SHALL modify DNS Queries for for A records going into
           the V6 domain by replacing the string "IN-ADDR.ARPA" with the string "IP6.ARPA" in
           "Node address to Node name query requests"'
RQ ref    : RQ_003_6003, RQ_003_6018, RQ_003_6019
Role      : NAT-PT_router
config    : CF_TRA_03
TD ref    : TD_TRA_6018_01
with {
    EUT configured 'as Bi-Directional-NAT-PT with DNS-ALG'
    and QE3 configured with at least 1 AAAA_record for QE1
}
ensure that {
    when { QE2 sends a PTR_DNS_Query for QE1 to QE3 }
    then { QE2 indicates receipt of all the A_records for QE1 from QE3 }
}

End Group 3.1

Group 3.2 'Traditional NAT-PT Operation'

--xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx--

TP id     : TP_TRA_6006_01
summary   : 'In basic NAT-PT implementation, if the outgoing packet is not a session initialisation
           packet
           and the NAT-PT does not already have stored some state about the related session,
           the packet SHOULD be silently discarded'
RQ ref    : RQ_003_6006
Role      : NAT-PT_router
config    : CF_TRA_04
TD ref    : TD_TRA_6006_01
with {
}
ensure that {
    when { QE1 sends a packet not indicating a session_initialisation
           and indicating that a response is requested
           to QE2 }
    then { EUT silently discards the packet }
}

```

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```

TP id   : TP_TRA_6007_01
summary : 'In basic NAT-PT implementation, if the outgoing packet is a session initialisation
packet,
        the NAT-PT SHALL locally allocate an address from its pool of addresses'
RQ ref  : RQ_003_6007, RQ_003_6008
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6007_01
with {
}
ensure that {
  when {   QE1 sends a IPv6_packet indicating a session_initialisation
           and indicating that a response is requested
           to QE2 }
  then {   EUT translates the IPv6_packet to an IPv4_packet
           before QE1 receives the response from QE2}
}

```

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```

TP id   : TP_TRA_6011_01
summary : 'In basic NAT-PT implementation, the NAT-PT SHALL determine and then translates the
returning
        packets belonging to the same session'
RQ ref  : RQ_003_6011, RQ_003_6012
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6011_01
with {
}
ensure that {
  when {   QE1 sends a packet indicating that a response is requested
           to QE2 }
  then {   EUT translates IPv6_packets to and from IPv4_packets
           before QE1 receives the response from QE2}
}

```

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```

TP id   : TP_TRA_6014_01
summary : 'With a NAT-PT between IPv6 and IPv4 realms, on receipt of a return IPv4 packet,
        the NAT-PT SHALL, on recognition of the TCP port, translate the packet back to V6'
RQ ref  : RQ_003_6014
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6014_01
with {
}
ensure that {
  when {   QE1 sends a TCP_packet indicating that a response is requested
           to QE2 }
  then {   EUT translates IPv6_packets to and from IPv4_packets
           before QE1 receives the response from QE2}
}

```

End Group 3.2

Group 3.3 'Protocol Translation Details'

--XXXXXXXXXXXXXXXXXXXXXXXXXXXX--

```

TP id   : TP_TRA_6032_01
summary : 'NAT-PT SHOULD translate all IP/ICMP headers from v4 to v6 in order to make end-to-end
IPv4 to IPv6 communication possible. With the exception of the Source Address
and Destination Address, the translation SHALL be as specified in SIIT [RFC 2765 [5].
This test is for ping packets'
RQ ref  : RQ_003_6032, RQ_003_6035, RQ_003_6036, RQ_003_6037
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6032_01
with {
}
ensure that {
  when {   QE2 sends a packet indicating that a response is requested to QE1 }
  then {   EUT translates the needed packets
}

```

```

        before QE2 receives the response from QE1}
    }

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6032_02
summary : 'NAT-PT SHOULD translate all IP/ICMP headers from v4 to v6 in order to make end-to-end
          IPv4 to IPv6 communication possible. With the exception of the Source Address
          and Destination Address, the translation SHALL be as specified in SIIT [RFC 2765 [5].
          This test is for ICMP Network Unreachable packets'
RQ ref  : RQ_003_6032, RQ_003_6035, RQ_003_6036, RQ_003_6037
Role    : NAT-PT_router
config  : CF_TRA_11
TD ref  : TD_TRA_6032_02
with {
    QE4 configured with no route to Network_B
}
ensure that {
    when {
        QE1 sends a packet indicating that a response is requested to QE2 }
    then {
        EUT translates the needed ICMP_packets
        before QE4 indicates that QE2 is not reachable to QE1}
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6033_01
summary : 'NAT-PT SHOULD translate all IP/ICMP headers from v6 to v4 in order to make end-to-end
          IPv6 to IPv4 communication possible. With the exception of the Source Address
          and Destination Address, the translation SHALL be as specified in SIIT [RFC 2765 [5].
          This test is for ping packets'
RQ ref  : RQ_003_6033, RQ_003_6038, RQ_003_6039, RQ_003_6040
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6033_01
with {
}
ensure that {
    when {
        QE1 sends a packet indicating that a response is requested to QE2 }
    then {
        EUT translates the needed packets
        before QE1 receives the response from QE2}
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6041_01
summary : 'The UDP checksums, when is set to a non-zero value, SHOULD be recalculated
          to reflect the address change from v4 to v6'
RQ ref  : RQ_003_6041
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6041_01
with {
}
ensure that {
    when {
        QE2 sends a UDP_packet indicating that a response is requested to QE1 }
    then {
        EUT translates the needed packets -- among them, the UDP checksum
        before QE2 receives the response from QE1}
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6042_01
summary : 'The TCP checksum SHOULD be recalculated to reflect the address change from v4 to v6'
RQ ref  : RQ_003_6042
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6042_01
with {
}
ensure that {
    when {
        QE2 sends a TCP_packet indicating that a response is requested to QE1 }
    then {
        EUT translates the needed packets -- among them, the TCP checksum
        before QE2 receives the response from QE1}
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6046_01
summary : 'The UDP checksums, when is set to a non-zero value, SHOULD be recalculated

```

```

    to reflect the address change from v6 to v4'
RQ ref : RQ_003_6046
Role   : NAT-PT_router
config : CF_TRA_04
TD ref : TD_TRA_6046_01
with {
}
ensure that {
  when { QE1 sends a UDP_packet indicating that a response is requested to QE2 }
  then { EUT translates the needed packets -- among them, the UDP checksum
        before QE2 receives the response from QE1 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_6047_01
summary : 'The TCP checksum SHOULD be recalculated to reflect the address change from v6 to v4'
RQ ref  : RQ_003_6047
Role    : NAT-PT_router
config  : CF_TRA_04
TD ref  : TD_TRA_6047_01
with {
}
ensure that {
  when { QE1 sends a TCP_packet indicating that a response is requested to QE2 }
  then { EUT translates the needed packets -- among them, the TCP checksum
        before QE1 receives the response from QE2 }
}

End Group 3.3

End Group 3

--*****--
--* RFC3056 - Connection of IPv6 Domains via IPv4 Clouds
--*****--

Group 4 'RFC3056 - Connection of IPv6 Domains via IPv4 Clouds'

Group 4.1 'Address Selection'

TP id   : TP_TRA_0005_01
summary : 'A 6to4 host having only one 6to4 address communicating with
          other 6to4 host having one 6to4 and one native addresses
          should use the 6to4 addresses'
RQ ref  : RQ_003_0005
Role    : 6to4_host
config  : CF_TRA_05
TD ref  : TD_TRA_0005_01
with {
  EUT configured with 1 6to4_address
  and EUT configured with no IPv6_native_address
  and QE1 configured with 1 6to4_address
  and QE1 configured with 1 IPv6_native_address
  and QE3 configured with 1 AAAA_record for the IPv6_native_address of QE1
  and QE3 configured with 1 AAAA_record for the 6to4_address of QE1
}
ensure that {
  when { EUT sends a packet indicating that a response is requested
        to the fully_qualified_domain_name of QE1
        and EUT receives all the AAAA_records for QE1 }
  then { EUT sends the packet to the 6to4_address of QE1
        before EUT receives the response from QE1 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_0005_02
summary : 'A 6to4 host having one 6to4 and one native addresses communicating with
          other 6to4 host having only one 6to4 address
          should use the 6to4 addresses'
RQ ref  : RQ_003_0005
Role    : 6to4_host
config  : CF_TRA_06
TD ref  : TD_TRA_0005_02
with {
  EUT configured with 1 6to4_address
  and EUT configured with 1 IPv6_native_address
  and QE2 configured with 1 6to4_address

```

```

    and QE2 configured with no IPv6_native_address
  }
ensure that {
  when { EUT sends a packet indicating that a response is requested
        to the 6to4_address of QE2
        }
  then { EUT sends the packet from its 6to4_address
        before EUT receives the response from QE2 }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_0007_01
summary : 'A 6to4 host having one 6to4 and one native addresses communicating with
          other 6to4 host having one 6to4 and one native addresses
          should use both native or both 6to4 addresses'
RQ ref  : RQ_003_0007
Role    : 6to4_host
config  : CF_TRA_06
TD ref  : TD_TRA_0007_01
with {   EUT configured with 1 6to4_address
        and EUT configured with 1 IPv6_native_address
        and QE2 configured with 1 6to4_address
        and QE2 configured with 1 IPv6_native_address
        }
ensure that {
  when { EUT sends a packet indicating that a response is requested
        to the 6to4_address of QE2
        }
  then { EUT sends the packet from its 6to4_address
        before EUT receives the response from QE2 }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id   : TP_TRA_0007_02
summary : 'A 6to4 host having one 6to4 and one native addresses communication with
          other 6to4 host having one 6to4 and one native addresses
          should use both native or both 6to4 addresses'
RQ ref  : RQ_003_0007
Role    : 6to4_host
config  : CF_TRA_12
TD ref  : TD_TRA_0007_02
with {   EUT configured with 1 6to4_address
        and EUT configured with 1 IPv6_native_address
        and QE2 configured with 1 6to4_address
        and QE2 configured with 1 IPv6_native_address
        }
ensure that {
  when { EUT sends a packet indicating that a response is requested
        to the IPv6_native_address of QE2
        }
  then { EUT sends the packet from its IPv6_native_address
        before EUT receives the response from QE2 }
}

```

End Group 4.1

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

Group 4.2 'Encapsulation in IPv4'

```

TP id   : TP_TRA_0011_01
summary : 'The IPv4 packet body encapsulates the IPv6 header and payload'
RQ ref  : RQ_003_0011
Role    : 6to4_router
config  : CF_TRA_06
TD ref  : TD_TRA_0011_01
with {   QE1 configured with 1 6to4_address
        and QE2 configured with 1 6to4_address
        }
ensure that {
  when { QE1 sends a packet indicating that a response is requested
        to the 6to4_address of QE2
        }
  then { EUT encapsulates the QE1 packet into an IPv4_packet
        before QE1 receives the response from QE2 }
}

```

End Group 4.2

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

Group 4.3 'Maximum Transmission Unit'

```

TP id   : TP_TRA_0012_01
summary : 'The IPv4 "do not fragment" bit SHOULD NOT be set in the encapsulating
          IPv4 header'
RQ ref  : RQ_003_0012
Role    : 6to4_router
config  : CF_TRA_06
TD ref  : TD_TRA_0012_01
with {
    EUT configured not to perform IPv4_PMTU_Discovery
    and QE1 configured with 1 6to4_address
    and QE2 configured with 1 6to4_address
    and the PMTU of Network_D is lower than the IPv6_packets MTU
}
ensure that {
    when {
        QE1 sends an IPv6_packet indicating that a response is requested
        to the 6to4_address of QE2
    }
    then {
        EUT encapsulates the QE1 IPv6_packet into an IPv4_packet
        containing do_not_fragment_bit indicating false
        before QE1 receives the response from QE2
    }
}

```

End Group 4.3

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

Group 4.4 'Security Considerations'

--Note on TP_TRA_0049_01 related to RQ_003_0049: How can be generated a
 --packet with a source address equal to a non global unicast address?

End Group 4.4

End Group 4

--*****
 --* RFC3596 - DNS Extensions to Support IP Version 6
 --*****

Group 5 'RFC3596 - DNS Extensions to Support IP Version 6'

```

TP id   : TP_TRA_5005_01
summary : 'A DNSv6 server must return all AAAA records concerning
          a domain name when it receives a AAAA query'
RQ ref  : RQ_003_5005
Role    : DNSv6_server
config  : CF_TRA_07
TD ref  : TD_TRA_5005_01
with {
    EUT configured with at least 2 AAAA_records for QE2
}
ensure that {
    when {
        QE1 sends a AAAA_DNS_Query for QE2 to EUT
    }
    then {
        QE1 indicates receipt of all the AAAA_records for QE2 from EUT
    }
}

```

End Group 5

--*****
 --* RFC4213 - Basic Transition Mechanisms for IPv6 Hosts and Routers
 --*****

Group 6 'RFC4213 - Basic Transition Mechanisms for IPv6 Hosts and Routers'

```

TP id   : TP_TRA_4004_01
summary : 'An IPv6/IPv4 node must be able to deal with both A records
          and AAAA records'
RQ ref  : RQ_003_4004
Role    : IPv6/IPv4_Node
config  : CF_TRA_08
TD ref  : TD_TRA_4004_01

```

```

with {
    QE1 configured with at least 1 AAAA_record for QE2
    and QE1 configured with at least 1 A_record for QE2
    and EUT configured to use QE1 as DNS_Server
}
ensure that {
    when {
        EUT is requested to send an IPv6_packet
            indicating that a response is requested
            to QE2
        and EUT is requested to send an IPv4_packet
            indicating that a response is requested
            to QE2 }
    then {
        EUT indicates receipt of IPv6_response from QE2
        and EUT indicates receipt of IPv4_response from QE2 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_4047_01
summary : 'An IPv6/IPv4_Node must be able to decapsulate IPv6 in IPv4 packets'
RQ ref  : RQ_003_4047
Role    : IPv6/IPv4_Node
config  : CF_TRA_09
TD ref  : TD_TRA_4047_01
with {
    EUT configured to establish a static_tunnel to network_A via QE1
    and QE1 configured to establish a static_tunnel to network_B via EUT
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
            to QE3 }
    then { QE2 indicates receipt of the response from QE3 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_4048_01
summary : 'An IPv6/IPv4_Node acting as a decapsulator must check that the
          source of a received encapsulated packet is the address of
          the encapsulator'
RQ ref  : RQ_003_4048
Role    : IPv6/IPv4_Node
config  : CF_TRA_09
TD ref  : TD_TRA_4048_01
with {
    EUT configured to establish a static_tunnel to network_A via QE4
    and QE1 configured to establish a static_tunnel to network_B via EUT
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
            to QE3 }
    then { QE2 receives no response from QE3 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_4055_01
summary : 'An IPv6/IPv4_Node acting as a decapsulator must be able to
          reassemble an IPv4 packet of size 1500'
RQ ref  : RQ_003_4055, RQ_003_4057
Role    : IPv6/IPv4_Node
config  : CF_TRA_09
TD ref  : TD_TRA_4055_01
with {
    EUT configured to establish a static_tunnel to network_A via QE1
    and QE1 configured to establish a static_tunnel to network_B via EUT
}
ensure that {
    when { QE2 sends a packet of length 1500
            indicating that a response is requested
            to QE3 }
    then { QE2 indicates receipt of the response from QE3 }
}

--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--

TP id   : TP_TRA_4064_01
summary : 'An IPv6/IPv4_Node acting as a decapsulator must be decrement
          the hop limit of forwarded packets by one'
RQ ref  : RQ_003_4064
Role    : IPv6/IPv4_Node
config  : CF_TRA_09

```

```

TD ref : TD_TRA_4064_01
with {
    EUT configured to establish a static_tunnel to network_A via QE1
    and QE1 configured to establish a static_tunnel to network_B via EUT
}
ensure that {
    when { QE2 sends a packet indicating that a response is requested
          and indicating TTL of 3
          to QE3 }
    then { QE2 indicates receipt of the response from QE3 }
    when { QE2 sends a packet indicating that a response is requested
          and indicating TTL of 2
          to QE3 }
    then { QE2 receives no response from QE3 }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id : TP_TRA_4071_01
summary : 'An IPv6/IPv4_Node builds a link-local address for its tunnel
          interface using the interface IPv4 address'
RQ ref : RQ_003_4071, RQ_003_4073, RQ_003_4074
Role : IPv6/IPv4_Node
config : CF_TRA_09
TD ref : TD_TRA_4071_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
          to the link_local_address of EUT }
    then { QE1 indicates receipt of the response from EUT }
}

```

End Group 6

```

-----
--* RFC4214 - Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)
-----

```

Group 7 'RFC4214 - Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)'

```

TP id : TP_TRA_2009_01
summary : 'An ISATAP_Node builds a link-local address for its ISATAP
          interface using IPv4 address from its locator set'
RQ ref : RQ_003_2009
Role : ISATAP_Node
config : CF_TRA_10
TD ref : TD_TRA_2009_01
with {
}
ensure that {
    when { QE1 sends a packet indicating that a response is requested
          to the ISATAP_link_local_address of EUT }
    then { QE1 indicates receipt of the response from EUT }
}

```

```
--XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX--
```

```

TP id : TP_TRA_2018_01
summary : 'An advertising ISATAP_router only send unicast router
          advertisements'
RQ ref : RQ_003_2018
Role : ISATAP_Node
config : CF_TRA_10
TD ref : TD_TRA_2018_01
with {
}
ensure that {
    when { QE1 sends a Router_Solicitation to EUT }
    then { QE1 indicates receipt of a Router_Advertisement from EUT
          and QE2 indicates no receipt of a Router_Advertisement from EUT }
}

```

End Group 7

History

Document history		
V1.1.1	February 2008	Publication