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# Contents

Intelle	ectual Property Rights	4	
Forew	vord	4	
Moda	l verbs terminology	4	
1	Scope	5	
2 2.1 2.2	References	5	
3			
4	Test Suite Structure	6	
5	Test Purposes	6	
5.1	TPs for LSN		
5.1.1	Basic Function	7	
5.1.2	NAT Pools		
5.1.3	Address Withdrawal		
5.1.4	Fragmentation	10	
5.1.5	MSS Clamping		
5.1.6	Static Port & IP Reservation		
5.1.7	NAT Timers		
5.1.8	Application Layer Gateway		
5.1.9	Routing Tables		
5.1.10	,		
5.1.11	Redundancy		
5.1.12	Load-Balancing		
5.1.13	Failure Events	17	
Anne	x A (informative): Bibliography		
Histor	ry		

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#### Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Integrated broadband cable telecommunication networks (CABLE).

The present document produced for the transition technologies accommodates an urgent need in the industry to define requirements that enable seemless transition of Cable Networks to IPv6. Considering the depletion of IPv4 addresses, transition to IPv6 is required in order to enable continued growth of the customer base connected to Cable Networks and ensure service continuity for existing and new customers. High-quality connectivity to all kinds of IP-based services and networks is essential in today's business and private life.

A plethora of transition technologies have been proposed in IETF, other standardization organizations and by manufacturers of IP technology to allow coexistence of IPv4 and IPv6 hosts, access and core networks as well as services. Each of these technology options is specified, implemented and deployed in various forms and stages. The present document is based on the requirements of ETSI TS 101 569-1 [1].

The present document is part 2 of a multi-part deliverable covering the conformance test specification for NAT64 technology:

Part 1: "Protocol Implementation Conformance Statement (PICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS&TP)";

Part 3: "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

## Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "may not", "need", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the <u>ETSI Drafting Rules</u> (Verbal forms for the expression of provisions).

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#### 1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) descriptions for the IPv6 transition technology NAT64 to validate its implementation within a cable communications networks.

The tests are in reference to [1], the ETSI specifications for IPv6 transition technology.

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [i.1] and ISO/IEC 9646-2 [i.2]) as well as the ETSI rules for conformance testing (ETS 300 406 [i.3]) are used as a basis for the test methodology.

5

### 2 References

#### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <a href="http://docbox.etsi.org/Reference">http://docbox.etsi.org/Reference</a>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 101 569-1: "Integrated Broadband Cable Telecommunication Networks (CABLE); Cable Network Transition to IPv6 Part 1: IPv6 Transition Requirements".

#### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1]	ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
[i.2]	ISO/IEC 9646-2 (1994): "Information technology Open Systems Interconnection Conformance testing methodology and framework Part 2: Abstract Test Suite specification".
[i.3]	ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

#### 3 Abbreviations

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

ALG	Application Layer Gateway
ATS	Abstract Test Suite
B4	(NAT64) Basic Bridging BroadBand element

CPE	Customer Premises Equipment
DF	Do not Fragment flag (in IPv4 header)
FTP	File Transfer Protocol
GRT	Global Routing Table
GW	GateWay
HTML	HyperText Markup Language
ICMP	Internet Control Message Protocol
IP	Internet Protocol
IPv4	IP version 4
IPv6	IP version 6
IUT	Implementation Under Test
LSN	Large Scale NAT
MSS	(TCP) Maximum Segment Size
MTS	Methods for Testing and Specification
MTU	Maximum Transmission Unit
NAT	Network Address Translation/Network Address Translator
NPU	Network Processing Unit
PICS	Protocol Implementation Conformance Statement
PPTP	Point to Point Tunelling Protocol
RTSP	Real Time Streaming Protocol
SIP	Session Initiation Protocol
TC	Test Case
TCP	Transmission Control Protocol
TP	Test purpose
VRF	Virtual Routing and Forwarding

# 4 Test Suite Structure

The identifier of the TP is built according to table 1 as recommended in the MTS methodologies.

#### Table 1: TP naming convention

TP/ <root>/<gr>/<xs <nn=""></xs></gr></root>		
<root> = root</root>	NAT64	Mapping of Address and Port – Encapsulation
		Mode
<gr> = group</gr>		Large Scale NAT
<sgr> = sub-group</sgr>		Basic Function
	NP	NAT Pools
	AW	Address Withdrawal
	FRAG	Fragmentation
	MSSC	Maximum Segment Size Clamping
	SPR	Static Port Reservation
	NT	NAT Timers
	ALG	Application Layer Gateways
	RT	Routing Tables
	AA	Anycast Addressing
	RED	Redundancy
	LB	Load-balancing
	FE	Failure Events
<x> = type of testing</x>	BV	Valid Behaviour tests
<nn> = sequential number</nn>		01 to 99
NOTE: A sub-group may not apply for all groups.		

# 5 Test Purposes

Proposes a TP proforma which is used in the present document. The fields of this proforma as used in the present document are explained in table 2.

	TP Header		
TP ID	The TP ID is a unique identifier according to the TP naming conventions in tables		
Test objective	Short description of test purpose objective according to the requirements from the base standard.		
Reference	The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.		
	TP Behaviour		
Initial conditions (optional)	The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding "Test Case" (TC), when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.		
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding TC, "Pass" or "Fail" verdicts can be assigned there.		

#### Table 2: TP proforma field description

7

## 5.1 TPs for LSN

#### 5.1.1 Basic Function

TP ld	TP/NAT64/LSN/BF/BV/01		
Test objective	Check that the IUT supports the functionality of NAT64 1:1 NAT mapping		
Reference	[1]:6.5.7.9 1:1 IP Mapping		
	Initial conditions		
with {			
the IUT being proper	ly provisioned		
	connected & functional		
}			
<u> </u>	Expected behaviour		
ensure that {			
when {			
•	multiple IPv6 packets		
	/6 transport header		
	source address		
	ing client IPv6 address		
containing destination address			
indicating IUT GW IPv6 prefix first 64 bits			
	indicating IUT IPv4 embedded into the IPv6 address in last 64 bits		
from multiple clie	nt devices		
}			
then {			
the IUT does a 1:	1 NAT mapping for each public IPv6 Client address sourced		
and the IUT forwa	and the IUT forwards packets to the destination with different IPv4 public addresses		
}			
}			

P ld	TP/NAT64/LSN/BF/BV/02		
Test objective	Check that the IUT supports the functionality of NAT64 1:n NAT mapping with port translation		
Reference	[1]:6.4.4.4 Feature: Shared/Split Resources		
	Initial conditions		
with {			
the IUT was properly	provisioned		
the interfaces are con	inected & functional		
}			
	Expected behaviour		
ensure that {			
when {			
	nultiple IPv6 packets		
containing IPv	6 transport header		
	source address		
indicati	ng client IPv6 address		
	destination address		
	indicating IUT GW IPv6 prefix first 64 bits		
indicating IUT IPv4 embedded into the IPv6 address in last 64 bits			
from multiple client devices			
}			
then {			
the IUT does a 1:n NAT mapping for multiple public IPv6 B4 addresses sourced			
	and the IUT forwards packets to the destination with the same public IPv4 source address		
}	· · · · · · · · · · · · · · · · · · ·		
) í			

#### 5.1.2 NAT Pools

TP ld	TP/NAT64/LSN/NP/BV/01	
Test objective Check that the IUT supports the functionality of multiple NAT pools per prefix		
Reference	[1]:6.4.6.10 Feature: NAT Grouping resource Sharing // [1]:6.4.4.4] Feature: Shared/Split	
	Resources	
	Initial conditions	
with {		
the IUT was proper	y provisioned	
	onnected & functional and,	
the six clients being	configured with two separate prefixes, one prefix for three clients.	
}		
	Expected behaviour	
ensure that {		
when {		
	s multiple IPv6 packets	
	Pv6 transport header	
	g source address	
	ating client IPv6 address	
	g destination address	
indica	ating IUT GW IPv6 prefix first 64 bits	
indica	ating IUT IPv4 embedded into the IPv6 address in last 64 bits	
from multiple client devices		
}		
then {		
	1:n NAT mapping for multiple public IPv6 client addresses sourced	
and the IUT forv	vards packets to the destination with some of the same and some different public IPv4 source	
address matchir	ng the NAT pools dependent on the prefix assigned	
}		
1		

#### 5.1.3 Address Withdrawal

P ld	TP/NAT64/LSN/AW/BV/01		
Test objective	Check that the IUT supports LSN GW address withdrawal on cache failure		
Reference	[1]:6.4.6.16 NAT64 Address Withdrawal		
	Initial conditions		
with {			
the IUT was properly	provisioned		
the interfaces are co			
}			
	Expected behaviour		
ensure that {	•		
when {			
the IUT receives	multiple IPv6 packets		
containing IP	/6 transport header		
	source address		
	ing client IPv6 address		
	destination address		
	ing IUT GW IPv6 prefix first 64 bits		
	ing IUT IPv4 embedded into the IPv6 address in last 64 bits		
	•		
containing TCP payload and the cache is removed			
	Tentoveu		
thon (			
-	then {		
	s its Gateway Prefix		
<u>}</u>			
}			

P ld	TP/NAT64/LSN/AW/BV/02		
Test objective	Check that the IUT supports LSN GW address withdrawal on route failure		
Reference	[1]:6.4.6.16 NAT64 Address Withdrawal		
	Initial conditions		
with {			
the IUT was properly	/ provisioned		
the interfaces are co			
}			
	Expected behaviour		
ensure that {			
when {			
the IUT receives	the IUT receives multiple IPv6 packets		
containing IP	v6 transport header		
containing	source address		
indicat	ting client IPv6 address		
containing	g destination address		
indicat	indicating IUT GW IPv6 prefix first 64 bits		
indicat	ting IUT IPv4 embedded into the IPv6 address in last 64 bits		
containing TCP payload			
and the routes are removed for the next hop			
then {			
the IUT withdraw	s its Gateway Prefix		
}	}		
}			

P Id	TP/NAT64/LSN/AW/BV/03		
	Check that the IUT supports LSN GW address withdrawal on hardware failure		
Reference	[1]:6.4.6.16 NAT64 Address Withdrawal		
	Initial conditions		
with {			
the IUT was properly	provisioned		
the interfaces are con	nnected & functional		
}			
-	Expected behaviour		
ensure that {			
when {			
the IUT receives r	nultiple IPv6 packets		
	6 transport header		
•	containing in voltarisport neader		
	ng client IPv6 address		
	destination address		
	ng IUT GW IPv6 prefix first 64 bits		
	ng IUT IPv4 embedded into the IPv6 address in last 64 bits		
containing	containing TCP payload		
and the processing hardware simulates a failure			
then {			
-	the IUT withdraws its Gateway Prefix		
1			
1			
5			

# 5.1.4 Fragmentation

TP ld	TP/NAT64/LSN/FRAG/BV/01	
Test objective	Check that the IUT fragments an HTML IPv4 packet downstream	
Reference	[1]:6.4.6.20 LSN Fragmentation and Buffering	
	Initial conditions	
with {		
the IUT was properly		
the interfaces are cor		
	ny-MTU) size being equal or greater than the IPv4 or IPv6 packet between all devices	
and the NAT64 MTU	being higher than the IPv4 packet	
}		
	Expected behaviour	
ensure that {		
when {		
	an HTML IPv4 packet from the internet	
containing sou		
	a private IPv4 address	
	containing the DF bit	
	indicating the value 0.	
with a packet size greater than the NAT64-Tunnel-MTU		
}		
then {		
the IUT fragments the IPv4 packet before it encapsulates it in IPv6		
and the IUT forwards correctly formatted fragmented packets		
}		
}		

# 5.1.5 MSS Clamping

TP ld	TP/NAT64/LSN/MSSC/BV/01
Test objective	Check that the IUT functions with MSS clamping
Reference	[1]:6.4.9 Technical Viability
	Initial conditions
with {	
the physical MTU (P	hy-MTU) size being equal or greater than the IPv6 packet between all devices
and the MTU (IPv6-N	MTU) being lower than the originating IPv6 packet
and the MSS value i	s below that of the TCP segment size of the incoming packet
}	
	Expected behaviour
ensure that {	
when {	
	an HTML IPv4 packet
containing so	
	a private IPv4 address
with a segment s	ize greater than the IUT MSS value
}	
then {	
and the IUT drops the packet & returns a packet-too-big message to the originator	
}	
}	

#### 5.1.6 Static Port & IP Reservation

TP ld	TP/NAT64/LSN/SPR/BV/01	
Test objective	Check that the IUT functions with static port reservation per prefix downstream	
Reference	[1]:6.4.6.22 Feature: Port Reservation	
	Initial conditions	
with {		
the IUT was properly provision	ned	
the interfaces are connected	& functional	
the static entries of well know	n ports for a singular prefix is configured on the IUT	
}		
	Expected behaviour	
ensure that {		
when {		
the IUT receives multiple I	Pv4 packets downstream	
containing IPv4 transp	ortheader	
containing source a		
•	indicating client IPv4 public address	
containing destinat		
	IPv4 public static address	
}		
then {		
	t forward is forwarded to an internal client by the IUT	
}		
1		
5		

#### 5.1.7 NAT Timers

TP ld	TP/NAT64/LSN/NT/BV/01	
Test objective	Check that the IUT TCP_time_wait timer expires when required	
Reference	[1]:6.4.6.4 NAT64 LSN timers	
	Initial conditions	
with {		
the IUT being prop	erly provisioned	
	are connected & functional	
and the IUT TCP	time_wait timer being set	
	g received an IPv6 packet	
	containing TCP payload indicating port numbers	
1	is port numbers	
3	-	
	Expected behaviour	
ensure that {		
when {		
the TCP_time_	wait timer expires	
and the IUT ha	iving received a second IPv6 packet	
containing s	source address	
indicatin	ng a different IPv6 address to the first IPv6 packet	
containi	containing TCP payload	
	indicating the same port numbers as the first originating packet	
}		
then {		
the IUT decapsulates the IPv4 packet		
	and the IUT forwards it on	
1		
1		

### 5.1.8 Application Layer Gateway

TP ld	TP/NAT64/LSN/ALG/BV/01	
Test objective	Check that the IUT supports FTP forwarding through an ALG	
Reference	[1]:6.4.1 LSN Feature Summary	
	Initial conditions	
with {		
the IUT being	properly provisioned	
	aces are connected & functional	
and the IUT b	peing configured with FTP ALG set to active	
	client being authenticated with the FTP server	
}	-	
	Expected behaviour	
ensure that {		
when {		
the IUT re	eceives multiple IPv6 packets	
contai	ning IPv6 transport header	
CO	ntaining source address	
	indicating client IPv6 address	
CO	ntaining destination address	
	indicating IUT GW IPv6 prefix first 64 bits	
	indicating IUT IPv4 embedded into the IPv6 address in last 64 bits	
CO	containing TCP payload	
indicating port number 20		
}		
then {		
the IUT forwards the FTP packet to the FTP server		
	the IUT creates the corresponding NAT binding	
}	}	
}		

TP ld	TP/NAT64/LSN/ALG/BV/02	
Test objective	t objective Check that the IUT supports SIP forwarding through an ALG	
Reference	Reference [1]:6.4.1 LSN Feature Summary	
	Initial conditions	
with {		
	properly provisioned	
	aces are connected & functional	
	eing configured with SIP ALG set to active	
and the SIP c	lient being authenticated with the SIP server	
}		
	Expected behaviour	
ensure that {		
when {		
	ceives multiple IPv6 packets	
	ning IPv6 transport header	
COI	ntaining source address	
	indicating client IPv6 address	
COI	ntaining destination address	
	indicating IUT GW IPv6 prefix first 64 bits	
	indicating IUT IPv4 embedded into the IPv6 address in last 64 bits	
COL	containing TCP payload	
indicating port number 5060		
then {		
•		
	the IUT forwards the SIP packet to the SIP client	
	the IUT creates the corresponding NAT binding	
3		
1		

TP ld	TP/NAT64/LSN/ALG/BV/03
Test objective	Check that the IUT supports RTSP forwarding through an ALG
Reference	[1]:6.4.1 LSN Feature Summary
	Initial conditions
with {	
the IUT being	properly provisioned
and the interfa	aces are connected & functional
and the IUT b	eing configured with RTSP ALG set to active
and an RTSP	session is setup from a client on behind the CPE and a server behind the LSN
}	
	Expected behaviour
ensure that {	
when {	
the IUT re	ceives multiple IPv6 packets
contair	ning IPv6 transport header
cor	ntaining source address
	indicating client IPv6 address
cor	ntaining destination address
	indicating IUT GW IPv6 prefix first 64 bits
	indicating IUT IPv4 embedded into the IPv6 address in last 32 bits
cor	ntaining TCP payload
	indicating port number 5060
}	
then {	
	rwards the RTSP packet to the RTSP server
the IUT cr	eates the corresponding NAT binding
}	
}	

TP ld	TP/NAT64/LSN/ALG/BV/04	
Test objective	est objective Check that the IUT supports PPTP forwarding through an ALG	
Reference	Reference [1]:6.4.1 LSN Feature Summary	
	Initial conditions	
with {		
	properly provisioned	
	aces are connected & functional	
	eing configured with PPTP ALG set to active	
and a PPTP s	session is setup from a client on behind the CPE and a server behind the LSN	
}		
	Expected behaviour	
ensure that {		
when {		
	ceives multiple IPv6 packets	
	ning IPv6 transport header	
COI	ntaining source address	
	indicating client IPv6 address	
COL	ntaining destination address	
	indicating IUT GW IPv6 prefix first 64 bits	
	indicating IUT IPv4 embedded into the IPv6 address in last 32 bits	
COI	containing TCP payload	
indicating port number 5060		
then {		
the IUT forwards the PPTP packet to the PPTP server		
	the IUT creates the corresponding NAT binding	
}		
}		

TP ld	TP/NAT64/LSN/ALG/BV/05
	Check that the IUT supports ICMP translation
Reference	[1]:6.4.1 LSN Feature Summary
	Initial conditions
with {	
the IUT being	properly provisioned
	aces are connected & functional
}	
	Expected behaviour
ensure that {	
when {	
the IUT re	ceives multiple ICMP IPv6 packets
contair	ning IPv6 transport header
	ntaining source address
	indicating client IPv6 address
cor	ntaining destination address
	indicating IUT GW IPv6 prefix first 64 bits
indicating IUT IPv4 embedded into the IPv6 address in last 64 bits	
}	
then {	
•	rwards the ICMP packets in IPv4 after translation
1	
1	
}	

# 5.1.9 Routing Tables

the IUT being properly provisioned, and the interfaces are connected & functional, and the routing tables are configured GRT upstream ingress & VRF upstream egress } Expected behaviour			
Reference       [1]:6.4.1       LSN Feature Summary         Initial conditions         with {       the IUT being properly provisioned,         and the interfaces are connected & functional,         and the routing tables are configured GRT upstream ingress & VRF upstream egress         Expected behaviour         ensure that {         when {         the IUT receives multiple IPv6 packets         containing IPv6 transport header         containing client IPv6 address         indicating client IPv6 address         containing destination address         indicating IUT GW IPv6 prefix first 64 bits         indicating IUT IPv4 embedded into the IPv6 address in last 64 bits         }       then {	TP Id	TP/NAT64/LSN/RT/BV/01	
Initial conditions  initia	Test objective	Check that the IUT supports forwarding from GRT TO VRF	
<pre>with {     the IUT being properly provisioned,     and the interfaces are connected &amp; functional,     and the routing tables are configured GRT upstream ingress &amp; VRF upstream egress } Expected behaviour ensure that {     when {         the IUT receives multiple IPv6 packets             containing IPv6 transport header             containing source address             indicating client IPv6 address             containing destination address             indicating IUT GW IPv6 prefix first 64 bits             indicating IUT IPv4 embedded into the IPv6 address in last 64 bits     }     then { </pre>	Reference	[1]:6.4.1 LSN Feature Summary	
the IUT being properly provisioned, and the interfaces are connected & functional, and the routing tables are configured GRT upstream ingress & VRF upstream egress Expected behaviour ensure that { when { the IUT receives multiple IPv6 packets containing IPv6 transport header containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT GW IPv6 prefix first 64 bits } then {		Initial conditions	
and the interfaces are connected & functional, and the routing tables are configured GRT upstream ingress & VRF upstream egress Expected behaviour ensure that { when { the IUT receives multiple IPv6 packets containing IPv6 transport header containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	with {		
and the routing tables are configured GRT upstream ingress & VRF upstream egress  Expected behaviour  ensure that {     when {         the IUT receives multiple IPv6 packets             containing IPv6 transport header             containing source address             indicating client IPv6 address             containing destination address             indicating IUT GW IPv6 prefix first 64 bits             indicating IUT IPv4 embedded into the IPv6 address in last 64 bits     }     then { }	the IUT being	properly provisioned,	
Expected behaviour ensure that { when { the IUT receives multiple IPv6 packets containing IPv6 transport header containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	and the interfa	aces are connected & functional,	
ensure that {     when {         the IUT receives multiple IPv6 packets         containing IPv6 transport header         containing source address         indicating client IPv6 address         containing destination address         indicating IUT GW IPv6 prefix first 64 bits         indicating IUT IPv4 embedded into the IPv6 address in last 64 bits     }     then {	and the routin	g tables are configured GRT upstream ingress & VRF upstream egress	
ensure that {     when {         the IUT receives multiple IPv6 packets         containing IPv6 transport header         containing source address         indicating client IPv6 address         containing destination address         indicating IUT GW IPv6 prefix first 64 bits         indicating IUT IPv4 embedded into the IPv6 address in last 64 bits     }     then {	}		
<pre>when {     the IUT receives multiple IPv6 packets         containing IPv6 transport header         containing source address         indicating client IPv6 address         containing destination address         containing IUT GW IPv6 prefix first 64 bits         indicating IUT GW IPv6 embedded into the IPv6 address in last 64 bits } then { </pre>		Expected behaviour	
the IUT receives multiple IPv6 packets containing IPv6 transport header containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT GW IPv6 prefix first 64 bits findicating IUT IPv4 embedded into the IPv6 address in last 64 bits	ensure that {		
containing IPv6 transport header containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	when {		
containing source address indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	the IUT re	ceives multiple IPv6 packets	
indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	contair	ning IPv6 transport header	
indicating client IPv6 address containing destination address indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	cor	ntaining source address	
indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {		indicating client IPv6 address	
indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 64 bits } then {	cor		
} then {			
} then {			
•	}	•	
the IUT forwards the IPv4 packets once translated }	then {		
}	the IUT fo	the IUT forwards the IPv4 packets once translated	
	}	}	
	}		

TP ld	TP/NAT64/LSN/RT/BV/02
Test objective	Check that the IUT supports forwarding from VRF TO GRT
Reference	[1]:6.4.1 LSN Feature Summary
	Initial conditions
with {	
the IUT being	properly provisioned,
and the interfa	aces are connected & functional,
and the routin	g tables are configured VRF upstream ingress & GRT upstream egress
}	
	Expected behaviour
ensure that {	
when {	
the IUT re	ceives multiple IPv6 packets
contair	ning IPv6 transport header
cor	ntaining source address
	indicating client IPv6 address
cor	ntaining destination address
	indicating IUT GW IPv6 prefix first 64 bits
indicating IUT IPv4 embedded into the IPv6 address in last 64 bits	
}	
then {	
•	rwards the IPv4 packets once translated
3	
, , , , , , , , , , , , , , , , , , ,	
1	

### 5.1.10 Anycast Addressing

TP Id	TP/NAT64/LSN/AA/BV/01	
Test objective	Test objective Check that the IUT supports Anycast GW addressing	
Reference	[1]:6.4.6.14 Feature: Anycast Gateway Address	
	Initial conditions	
with {		
the IUT is properly		
	connected & functional	
the IUT is configure	ed with an Anycast address	
]		
	Expected behaviour	
ensure that {		
when {		
the IUT receive	es multiple IPv6 packets	
	Pv6 transport header	
containi	ng source address	
indic	ating client IPv6 address	
containi	ng destination address	
indic	ating IUT GW IPv6 prefix first 64 bits	
indicating IUT IPv4 embedded into the IPv6 address in last 64 bits		
from multiple client devices		
then {		
and the IUT for	and the IUT forwards packets to the destination	
}	}	
}		

# 5.1.11 Redundancy

TP Id					
	TP/NAT64/LSN/RED/BV/01				
Test objective	Check that the IUT supports Redundant NPUs				
Reference	[1]:6.4.1 NAT64 LSN Technology Feature Summary				
	Initial conditions				
with {					
the IUT is properly provisioned					
the interfaces are of	connected & functional				
the IUT is configure	ed with redundant NPUs				
Expected behaviour					
ensure that {	•				
when {					
the IUT receives multiple IPv6 packets					
containing IPv6 transport header					
containing source address					
•					
indicating client IPv6 address containing destination address					
indicating IUT GW IPv6 prefix first 64 bits indicating IUT IPv4 embedded into the IPv6 address in last 32 bits					
from multiple client devices					
the active NPU is removed from the IUT					
then {					
	the IUT forwards packets to the destination before the NPU removal				
and the IUT for	and the IUT forwards packets to the destination after the NPU removal				
}					
}					

### 5.1.12 Load-Balancing

TP ld	TP/NAT64/LSN/LB/BV/01				
Test objective	Check that the IUT supports load-balancing across NPUs				
Reference	[1]:6.4.4.5 Feature: Traffic Based Load Balanced NPUs				
Initial conditions					
with {					
the IUT is properly	the IUT is properly provisioned				
the interfaces are connected & functional					
the IUT is configured with multiple NPUs					
Expected behaviour					
ensure that {					
when {					
the IUT receive	es multiple IPv6 packets				
containing	Pv6 transport header				
	ng source address				
indicating client IPv6 address					
	containing destination address				
	indicating IUT GW IPv6 prefix first 64 bits				
indicating IUT IPv4 embedded into the IPv6 address in last 32 bits					
from multiple client devices					
then {					
the IUT forwards packets to the destination using all NPUs in the system according to load-balancing rules					
}					
L)					

17

### 5.1.13 Failure Events

TP Id	TP/NAT64/LSN/FE/BV/01				
Test objective	Check that the IUT withdraws its IPv6 prefix when all NPUs fail				
Reference	[1]:6.4.6.16 Feature: NAT64 Address Withdrawal				
	Initial conditions				
with {					
the IUT is properly provisioned					
	connected & functional				
the IUT is configure	ed with multiple NPUs				
]					
Expected behaviour					
ensure that {	·				
when {					
the IUT receives multiple IPv6 packets					
containing IPv6 transport header					
containing source address					
indicating client IPv6 address					
containing destination address					
indicating IUT GW IPv6 prefix first 64 bits					
indicating IUT IPv4 embedded into the IPv6 address in last 32 bits					
from multiple client devices					
and all NPUs are removed from the IUT					
then {					
the IUT forwards packets to the destination using all NPUs in the system before NPU removal					
	and the IUT withdraws its IPv6 prefix when all NPUs in the system are removed				
}					
3					
, J					

TP ld	TP/NAT64/LSN/FE/BV/02				
Test objective	Check that the IUT withdraws its IPv6 prefix when the NAT64 instance is shut down				
Reference	[1]:6.4.6.16 Feature: NAT64 Address Withdrawal				
	Initial conditions				
with {					
the IUT is properly	r provisioned				
	connected & functional				
the IUT is configur	ed with multiple NPUs				
Expected behaviour					
ensure that {	·				
when {					
the IUT receive	es multiple IPv6 packets				
	IPv6 transport header				
containing source address					
indicating client IPv6 address					
	containing destination address				
indicating IUT GW IPv6 prefix first 64 bits					
	indicating IUT IPv4 embedded into the IPv6 address in last 32 bits				
	from multiple client devices				
and the NAT64 function on the IUT is shut down					
then {					
the IUT forwards packets to the destination using all NPUs in the system before NPU removal					
	and the IUT withdraws its IPv6 prefix when the NAT64 function is shut down				
3					
1	L				
ſ					

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19

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# History

Document history					
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