NICC ND 1411 V1.3.1 (2009-09)

NICC Document

NGN Interconnect:
PSTN Signalling Operational Test Manual

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Contents

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Foreword

This NICC Document (ND) has been produced by the NICC TSG Testing Specifications Working Group.

Introduction

This document forms an Operational Testing Manual [OTM] template that can be used by CPs as a basis for part of the testing requirements when interconnecting their Next Generation Network [NGN] to another CPs NGN.

It is one of a series of documents (ND1410-14) which form a complete testing process for NGN PSTN interconnect.

1 Scope

It has been agreed in NICC that CPs must take a responsible approach to testing. This can be achieved by ensuring that CPs who want to interconnect to other CPs follow an appropriate process of testing before that interconnect is put into service.

It is recommended that testing should consist of the following stages:

- Validation (prior to any interconnection) - ND1413 [8] *
- Integration (of model networks) - ND1414 [10] *

  * Appropriate when an unknown combination of equipment is to be connected
- Operational (of live routes) ND1410 [2], ND1411 and ND1412 [3]

This OTM should be used at the "operational" stage when interconnecting NGNs prior to "ready for service" or as part of the "ready for service" process.

It contains the minimum testing elements needed to test the signalling transport protocol of an NGN interconnect between CPs. Note that this document is written in terms of SCTP, however the same principles may be applied to interconnect using other signalling transport methods, e.g. TCP, with the test's procedure and results being adjusted appropriately. It should be read in conjunction with the other OTMs, ND1410 [2] and ND1412 [3] to define a complete set of tests for that interconnect.

It should not be considered to be a complete set of tests that meet any particular CPs exact testing requirement and there may be tests which are unsuitable to particular connection. Consequently, CPs should view this OTM as a template from which their own test requirements should be designed by adding, removing or modifying tests as appropriate provided they are agreed with the other CP.

2 References

For the particular version of a document applicable to this release see ND1610 [1].

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

2.1 Normative references

The following referenced documents are indispensable for the application of this 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] ND1610 Next Generation Networks, Release Definition
[2] ND1410 NGN Interconnect: PSTN Transport Operational Testing Manual
[3] ND1412 NGN Interconnect: PSTN Services Operational Testing Manual
[4] ND1612 Generic IP Connectivity for PSTN/ISDN Service between UK Next Generation Networks
[5] ND1017 Interworking between Session Initiation Protocol (SIP) and UK ISDN User Part (UK-ISUP)
[6] ND1613 Management of NGN Interconnect: Transport Connectivity Layer
[7] ND1701 Recommended Standard for the UK National Transmission Plan
[8] ND1413 NGN Interconnect: PSTN Validation Testing Manual
[9] ND1119 UK Interconnect: Use of Signalling for Packet-Based PSTN/ISDN
[10] ND1414 UK Interconnect - PSTN Integration Testing Manual

3 Abbreviations

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

BGW	Border Gateway
CP	Communication Provider
EET	Equipment Engaged Tone
ICMP	Internet Control Message Protocol
NGN	Next generation Network
NICC	Network Interoperability Consultative Committee
OTM	Operational Test Manual
PSTN	Public Switch Telephony Network
RTCP	Real Time Control Protocol
SCTP	Stream Control Transmission Protocol
SDP	Session Description Protocol
SIP	Session Initiation Protocol
VLAN	Virtual Local Area Network

4 Testing Requirements

4.1 Architecture

Within this document, reference is made to functions and interfaces. These functions and interfaces are described in detail in ND1612 [4]. Reference should be made to "Figure 1: Functional Architecture for PSTN / ISDN Generic Connectivity".

Where a different architecture is used, test procedure should be adapted as appropriate.

4.2 Methodology

Test results sheets should be retained locally in line with normal document retention guidance.

Where any test does not produce acceptable responses, the reasons should be investigated, a remedy attempted and the test repeated. The number of times the test is repeated and reasons why should be noted.

If the above process does not produce acceptable responses testing officers should follow appropriate escalation procedures to the relevant support groups and commercial teams.

If an immediate resolution can not be found, a time limited waiver should be agreed between the parties to allow the testing to continue, and the interconnect to be placed in service (provided that the issue is not service affecting).

Reference should be made to ND1017 [5] for all tests.

4.3 Tests

All of the following tests should be completed in full.

Test Name	**SCTP**
Test Number	SIG 01
Test Purpose	Verify SCTP set up via a signalling control function in order to test for signalling associations
Direction of Test	Bothway
Test Preconditions and Assumptions	That the appropriate IP connectivity between CPs exists. This will include IPSec tunnels and any related information must have been configured and verified as working

	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Where enabled, perform manual ping tests (or equivalent) at the media border function device, at least 1000 pings	There should be no cross connection between SCTP path addresses		
2	Bring up the association form one end	Check initialisation on the primary path		
3	Read own public SCTP association data at the SCTP end points and check for consistency at each end. Note, for multi-homed associations there will be two addresses at each end	Refer to ND1119 [9] for SCTP timer values. Note that any NAT functionality will prevent the private CP addresses being visible to the other CP		
4	Activate the SCTP association at both CP end points			
5	Check the SCTP association is established by checking the heart beat on all paths			

Test clean up	

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

Details Below

Notes:

Test Name	**Signalling Security**
Test Number	SIG 02
Test Purpose	To test authentication, encryption and data integrity - IPSec tunnel set up – part of call set-up, monitor IPSec protocol at the signalling control function for correct function. Note - these tests are a pre-cursor to anything beyond Ethernet level connectivity
Direction of Test	Bothway
Test Preconditions and assumptions	The Signalling Border Functions have been connected to the common transport function and have been configured for service The common transport function has been configured for service Optical/electrical signal are on the iT4a Signalling Border Functions The IPSec tunnel is running

	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Where enabled, perform manual ping tests (or equivalent) at the media border function device, at least 1000 pings	All pings are successful, with the loss of no pings, sent counter incremented by at least 1000, received counter incremented by at least 1000, errored counter at zero on iT4a interfaces on peer Signalling Border Functions		
2	Record the packets/bytes received, sent, dropped, errored counters on iT4b interfaces on peer media border function device	No packets or bytes lost or errored on iT4a interfaces on peer Signalling Border Functions and confirm IPSec counters are correctly incremented		
3	Confirm whether IPSec is running	IP Sec is running		
4	Change the network key at the A end	Ensure that the signalling path fails at the Signalling Border Functions		
5	Restore the key at the A end	Ensure signalling path restoration takes place		
6	Change the network key at the B end	Ensure that the signalling path fails at the Signalling Border Functions		
7	Restore the key at the B end	Ensure signalling path and IPSec restoration takes place		

Test clean up	Restore all signalling to service

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

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Notes:

Test Name	**SCTP Association Shutdown Verification and Start-up**
Test Number	SIG 03
Test Purpose	To verify the SCTP shutdown and start-up procedures
Direction of Test	Bothway
Test Preconditions and Assumptions	The association is established as in test 01

	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	CP A will shut down the association using a management interface	Verify the shutdown messages from the monitoring equipment and at CP B check the association status has changed to 'down'		
2	Re-establish association at CP A	Check signalling protocol		
3	Repeat test 1 and 2 from CP B end	As above		

Test clean up	

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

Details Below

Notes:

Test Name	**SCTP Multi-homing**			
Test Number	SIG 04			
Test Purpose	To test the multi-homing function of SCTP			
Direction of Test	Bothway			
Test Preconditions and assumptions	It is recommended that CPs test the basic IP connectivity between fC1s by 'pinging' first, where available			
	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Where enabled, perform manual ping tests (or equivalent) at the media border function device, at least 1000 pings	All pings are successful, with the loss of no pings, sent counter incremented by at least 1000, received counter incremented by at least 1000, errored counter at zero on iC1 interfaces on peer Signalling Border Functions.		
2	Disable one of the SCTP paths	Verify the SCTP association remains established via the alternate path using heart beats and acknowledgements, and an alarm is raised at both ends.		
3	Restore original path and disable the alternate path	As per test 2		
Test clean up	Ensure all signalling SCTP paths are restored to service			

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

Details Below

Notes:

Test Name	**SIP Headers**			
Test Number	SIG 05			
Test Purpose	To ensure that the correct version of SIP (v2.0) is used			
Direction of Test	Bothway			
Test Preconditions and Assumptions	This test should be performed with the use of signalling monitors			
	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Generate a call, answer and confirm:			
2	The correct SIP Profile C is being used; the correct p-charging vector is being used; the correct initial content and subsequent operation of max-forwards field	See ND1017 [5]		
3	The correct SIP URI address format is being used; an agreed signalling transport protocol is being used	See ND1612 [4]		
4	Confirm that appropriate media stream definitions are used in the SDP (coding types, packetisation rate etc)	See ND1612 [4] and ND1017 [5]		
Test clean up	Clear down the call			

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

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Details Below

Notes:

Test Name	**SDP**			
Test Number	SIG 06			
Test Purpose	To ensure correct codec and packetisation rate			
Direction of Test	Bothway			
Test Preconditions and Assumptions	These tests will be validated using a Signalling Monitor or equivalent			
	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Set up a PSTN voice call	Confirm that G.711 64kbit A-law with 10ms packetisation is being used ND1610 [1]		
2	Check in SDP for valid codec types signalled			
3	Check in SDP for correct packetisation rate			
4	Clear the voice call			
5	Set up a ISDN voice call			
6	Check in SDP for valid codec types signalled			
7	Check in SDP for correct packetisation rate			
8	Clear the ISDN call			
9	Set up a ISDN 64kbit Clear mode data connection			
10	Check in SDP for valid codec types signalled			
11	Check in SDP for correct packetisation rate			
12	Clear the ISDN call			
Test clean up	Ensure all calls are cleared			

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

Details Below

Notes:

Test Name	**Encapsulated ISUP Echo Control**
Test Number	SIG 07
Test Purpose	To check the setting and function of the Echo Control flags
Direction of Test	Bothway
Test Preconditions and Assumptions	These tests will be validated using a Signalling Monitor or equivalent. Refer to ND1017 [2] for further Echo Control information. It should be noted that these tests are for originating and terminating networks only; transit networks will not provide echo control as this should be done as near to the customer as possible

	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	Set up a voice call from CP A			
2	IAM echo control is ‘on’ (included)	No Echo control seized in receiving network		
3	ACM echo control is ‘on’ (included)	No Echo control seized in sending network		
4	Restore the first call and set up a voice call from CP B			
5	Echo Control provided in originating network	IAM echo control is ‘on’ (included)		
6	ACM echo control is ‘on’ (included)	No echo control is seized in the receiving network		
7	Clear the call			
8	Note - If the Echo Control flag is set to ‘off’ (not included)	Allow the call to proceed, but stop the test and investigate the Echo Control behaviour in the originating and terminating networks		

Test clean up	Ensure all calls are cleared

Conclusion & Observation

Completed ☐

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Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

Tick As Appropriate

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Notes:

Test Name	**Quality of Service**
Test Number	SIG 08
Test Purpose	To check the quality of the signalling
Direction of Test	Bothway
Test Preconditions and Assumptions	These tests will be validated using a Signalling Monitor or equivalent

	Test Steps	**Expected Results**	**Pass/Fail**	
			A-B	**B-A**
1	If available, check the SCTP statistics for packet loss and retransmission counts on a path basis			
Test clean up				

Conclusion & Observation

Completed ☐

Completed After Correction ☐ Due to Problem With: CP A ☐ CP B ☐

Completed With Waiver ☐ Waiver Reference ☐

Not Completed ☐ Due to Problem With: CP A ☐ CP B ☐

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Notes:

History

Document History		
Version	**Date**	**Milestone**
1.3.1	18/09/09	TSG/CA approval Version