

NGN Interconnect: PSTN Signalling Operational Test Manual

NICC Standards Limited

Michael Faraday House,
Six Dials Way,
Stevenage
SG1 2AY

Tel.: +44(0) 20 7036 3636

Registered in England and Wales under number 6613589

NOTICE OF COPYRIGHT AND LIABILITY

© 2009 NICC Standards Limited

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be that printing on NICC printers of the PDF version kept on a specific network drive within the NICC.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other NICC documents is available at:

<http://www.nicc.org.uk/nicc-public/publication.htm>

If you find errors in the present document, please send your comments to:

<mailto:help@niccstandards.org.uk>

Copyright

All right, title where and interest in this document are owned by NICC Standards Limited ("NICC") and/or the contributors to the document (unless otherwise indicated that copyright is owned or shared with a third party). Such title and interest is protected by United Kingdom copyright laws and international treaty provisions.

The contents of the document are believed to be accurate at the time of publishing, but no representation or warranty is given as to their accuracy, completeness or correctness. You may freely download, copy, store or distribute this document provided it is not modified in any way and it includes this copyright and liability statement.

You may not modify the contents of this document. You may produce a derived copyright work based on this document provided that you clearly indicate that it was created by yourself and that it was derived from this document and provided further that you ensure that any risk of confusion with this document is avoided.

Liability

Whilst every care has been taken in the preparation and publication of this document, neither NICC, nor any working group, committee, member, director, officer, agent, consultant or adviser of or to, or any person acting on behalf of NICC, nor any member of any such working group or committee, nor the companies, entities or organisations they represent, nor any other person contributing to the contents of this document (together the "Generators") accepts liability for any loss or damage whatsoever which may arise from the use of or reliance on the information contained in this document or from any errors or omissions, typographical or otherwise in the contents.

Nothing in this document constitutes advice. Nor does the transmission, downloading or sending of this document create any contractual relationship. In particular no licence is granted under any intellectual property right (including trade and service mark rights) save for the above licence to download copy, store and distribute this document and to produce derived copyright works.

The liability and responsibility for implementations based on this document rests with the implementer, and not with any of the Generators. If you implement any of the contents of this document, you agree to indemnify and hold harmless each Generator in any jurisdiction against any claims and legal proceedings alleging that the use of the contents by you or on your behalf infringes any legal or other right of any of the Generators or any third party.

None of the Generators accepts any liability whatsoever for any direct, indirect or consequential loss or damage arising in any way from any use of or reliance on the contents of this document for any purpose.

The NICC Standards Web site contains the definitive information on the [IPR Policy and Anti-trust Compliance Policy](#)

If you have any comments concerning the accuracy of the contents of this document, please write to:

The Technical Secretary, NICC Standards Ltd.,

Michael Faraday House,
Six Dials Way,
Stevenage
SG1 2AY

Contents

Intellectual Property Rights	4
Foreword.....	4
Introduction	4
1 Scope	5
2 References	6
3 Abbreviations	7
4 Testing Requirements.....	8
4.1 Architecture	8
4.2 Methodology.....	8
4.3 Tests.....	8
History	17

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to NICC.

Pursuant to the [NICC IPR Policy](#), no investigation, including IPR searches, has been carried out by NICC. No guarantee can be given as to the existence of other IPRs which are, or may be, or may become, essential to the present document.

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 from 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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>	
Completed With Waiver	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Not Completed	<input type="checkbox"/>				
Notes:					
			Details Below		

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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/> CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input style="width: 150px;" type="text"/>
Completed With Waiver	<input type="checkbox"/>			
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/> CP B <input type="checkbox"/>
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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>	
Completed With Waiver	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Not Completed	<input type="checkbox"/>				
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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>	
Completed With Waiver	<input type="checkbox"/>				
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>	
Completed With Waiver	<input type="checkbox"/>				
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Notes:					
			Details Below		

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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>	Details Below
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>		
Completed With Waiver	<input type="checkbox"/>					
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>	
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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>	Details Below
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>		
Completed With Waiver	<input type="checkbox"/>					
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>	
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	<input type="checkbox"/>	Tick As Appropriate	Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Completed After Correction	<input type="checkbox"/>		Waiver Reference	<input type="text"/>	
Completed With Waiver	<input type="checkbox"/>				
Not Completed	<input type="checkbox"/>		Due to Problem With:	CP A <input type="checkbox"/>	CP B <input type="checkbox"/>
Notes:					

Details Below

History

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