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# ND1409:2006/12

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## Guidelines

for UK NGN PSTN/ISDN IP Interconnect

Pre-Operational Testing

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Issue 2

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## 1. Scope

This Guideline lists the proposed testing required at pre-operational/model phase during the introduction of IP interconnect for PSTN/ISDN services (i.e. NGN ‘Purple Release’ interconnect – see ND1610 [1]). It is expected that testing will be performed internally by a CP using both a model and a live NGN networks.

This document considers the testing relevant to the PSTN/ISDN services excluding the transport layer as shown in table 1.

<b>PSTN/ISDN Calls</b>		
<b>PSTN/ISDN Signalling</b>		
<b>Bearer</b>	<b>BGW</b>	<b>Signalling</b>
<b>VLANs</b>		
<b>SDH</b>	<b>Ethernet Physical</b>	

Table 1

## 2. Glossary and References

### 2.1 Glossary

BER	Bit Error Rate
BGW	Border Gateway
CPS	Carrier Pre-Selection
IA	Indirect Access
NAT	Network Address Translation
PDD	Post Dialling Delay
VLAN	Virtual LAN

### 2.2 References

Ref no.	Document Reference	Title	Version	Publisher
[1]	ND1610:2006/05	Multi-Service Interconnect of UK Next Generation Networks	All Active Releases	NICC
[2]	ND1701:2006/01	Recommended Standard for the UK National Transmission Plan, NICC.	Issue 5	NICC
[3]	ND1012:2003/06	Interconnect Stream Control Transmission Protocol (SCTP) and Adaptation Layers	Issue 1	NICC
[4]	ND1017:2006/mm	Inter-working between Session Initiation Protocol (SIP) and UK ISDN User Part (UK ISUP)	Issue 1	NICC
[5]	ETSI TS 102 369	Methods for Testing and Specification (MTS); Stream Control Transmission Protocols (SCTP); Test Suite Structures and Test Purposes (TSS&TP)	V1.1.1	ETSI

### 3. Generic UK CP Pre-Operational Testing

#### 3.1 PSTN/ISDN Calls Tests

Test Cases/Objectives	Test Method
All current UK ISUP tests where applicable, as documented in the existing UK ISUP OTM that will include calls, including CPS, Non-Geo, IA, NTS and selective testing for partitioned services, CLI, Operator Assistance, 112/999 emergency preference, lawful intercept.	Using standard CP test calls.
Post Dialling Delay. A later issue of ND1701 [2] (the UK National Transmission Plan) will contain PDD recommendation. Until then, the test should ensure that PDD remains commensurate with customer and terminal equipment design expectations.	Make test calls, the level of post dialling delay will vary based on call type.
Voice quality, including echo and voice delay– by simple test calls, person to person.	Make test calls.
ISDN including call set up, BER, clearmode ISDN UDI.	Make ISDN calls within the CPs network.
Check Echo Control flag setting.	Check the Echo Control flags are set appropriately. Refer to ND1017 [2] for more information on echo control flag settings.
Congestion Control – checking correct responses to congestion control messages, signalling controls to prevent Call Server overload.	Do appropriate flood tests to ensure Call Server overload does not occur. Check the response times to the ‘back off’ message to prevent bandwidth hogging.

#### 3.2 Connectivity Tests

Test Cases/Objectives	Test Method
Testing of data in the transmission cross connects to ensure correct connectivity, typically checking for end to end packet delivery, connectivity ICMP ping tests, send and receive checks, trail connectivity tests and disconnect alarm tests. Additionally checking media resilience, path-disconnect and re-route.	<ol style="list-style-type: none"> <li>1. No traffic on VLAN. Disable VLAN at the A end and ensure an alarm is raised at the B. Restore, confirming that restoration takes place, and apply test in the opposite direction.</li> <li>2. Set up voice call over the VLAN. Apply the tests as in 1. Ensure the voice call is terminated appropriately and that subsequent calls are handled appropriately. Ensure a subsequent voice call is completed for multi-path scenarios, and EET is returned for single path.</li> </ol>

Test Cases/Objectives	Test Method
Verify the quality of the media stream using measurements conveyed in the RTCP reports.	Make a voice call lasting a minimum of 60 seconds and review the RTCP report, where available, to check quality of call.

### 3.3 Signalling Tests

Test Cases/Objectives	Test Method
Testing SCTP at the network and transport layers [5].	Apply tests in ETSI technical specification [5].
SIP Headers – correct version of SIP (v2.0), correct address format, specified transport protocol (SCTP [3]), correct Max Fwds figure, correct P Charging Vector format, SIP(I) Profile C only.	Generate an incoming PSTN call and check the parameters using a signalling monitor. Refer to ND1017 [4] for references to P headers.
SDP – contains information on codec type and packetisation, non conformant media streams, codec type, 10ms packetisation, 64kbit A-law and 64kbit Clear mode. [4]	Generate an incoming PSTN call and an ISDN data call and check the parameters using a signalling monitor.
NAT function – part of call set-up section - option depending on implementation.	Possible use of H.248 if Edge Session Control Function and Media Border Function are separate.
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.	<ol style="list-style-type: none"> <li>1. Confirm whether IPsec is running.</li> <li>2. Ensure the signalling path fails when the network key at the A end is changed.</li> <li>3. Restore the key at the A end and ensure restoration takes place. Change the key at the B end, and check that the signalling path fails.</li> <li>4. Restore and ensure restoration takes place.</li> </ol>
SCTP Multi-homing (Signalling re-routeing and session set up) – test signalling resilience, clean shut down of paths, re-routeing media paths as required.	<p>For first connection, i.e. when there is no live traffic being carried over the signalling VLAN –</p> <ol style="list-style-type: none"> <li>1. Change the IPsec key at the A end on one signalling VLAN and ensure the signalling continues via the alternate VLAN.</li> <li>2. Restore IPsec key, ensure restoration takes place, and repeat on the alternate VLAN.</li> <li>3. Repeat from the B end.</li> </ol>
Stream management – disable stream and check for re-route, checking call clear down	Disable the primary association and ensure the SCTP uses the secondary association.

Test Cases/Objectives	Test Method
Ordered and unordered delivery – ensure message sequence numbers are in order (possibly mis-ordered by multiple paths in CPs networks), checking for mis-sequencing and re-transmissions.	

### 3.4 Bandwidth Tests

Test Cases/Objectives	Test Method
Bandwidth management functionality – to limit the number of simultaneous calls.	Check for correct configuration. <ol style="list-style-type: none"> <li>1. At the sending end, restrict the bandwidth on the PSTN route using the media VLAN (using the bandwidth management function) to only allow a small number of PSTN calls (e.g. 3) and ensure the next (e.g. 4<sup>th</sup>), and any subsequent, call attempts fails with the appropriate message, taking into account any restrictions for emergency calls.</li> <li>2. At the receiving end, repeat the tests detailed in 1. above.</li> </ol>
Call Admission Control, check 64kbit/s pinhole only accepts 64bit/s call – policy on, for example (but not restricted to), 128kbit/s call shaping or stopping.	Check for correct functionality.

## 4. Other Potential Areas to Test

The following areas are not included for testing in this guidelines document but it is recommended that CPs perform some level of testing in these areas.

### SDH

General Framing Procedure  
Virtual concatenation  
Resilience of Sprung SDH change over  
SDH diagnostics

### ETHERNET

Ethernet Lag change over  
Topology hiding  
Packet loss  
Jitter  
Security  
Ethernet diagnostics  
Ethernet connectivity

## 5. Other Areas for Consideration

CPs need to de-risk the threats to networks in support of General Condition 3 in the Ofcom list of General Conditions for CPs. Through a programme of testing, gain assurance that end-to-end (customer-to-customer) interoperability will be achieved for all types of calls supported. Whilst the

scope of this document is the interconnection between CPs NGNs, internal testing of the CPs NGN network and interoperability between the CPs NGN and legacy networks will be required.

## 6. History

Issue 1	27 <sup>th</sup> October 2006	On TSG 28-day approval.
Issue 2	15 <sup>th</sup> December 2006	Approved for publication, noting there are some updates required during the formal review stage.

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