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*Technical Specification*

## **Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS NNI Interworking Test Specifications; Part 2: Test Descriptions for IMS NNI Interworking**

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**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

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Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
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## Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

The present document is part 2 of a multi-part deliverable covering the IMS NNI Interworking Test Specifications, as identified below:

- Part 1: "Test Purposes for IMS NNI Interworking";
- Part 2: "Test Descriptions for IMS NNI Interworking".**

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# 1 Scope

The present document specifies interoperability Test descriptions (TDs) for IMS NNI interworking for the IP Multimedia Call Control Protocol based on Stage 3 Session Initiation Protocol (SIP) and Session Description Protocol (SDP) standard, TS 124 229 [1]. TDs have been specified on the basis of the test purposes (TPs) and test suite structure (TSS) presented in [2]. TP fragments presented in the present document as part of TDs are defined using the TPLan notation (ES 202 553 [5]). TDs have been written based on the test specification framework described in TS 102 351 [3] and the interoperability testing methodology defined in TS 102 237-1 [4], i.e. interoperability testing with a conformance relation.

The scope of these test descriptions is not to cover all requirements specified in TS 124 229 [1]. It has been reduced to cover only requirements which relate to basic IMS call functionality for a minimal interworking IMS CN configuration, i.e. based on a P-CSCF, S-CSCF, I-CSCF, and HSS. Therefore, assessment of, e.g. IMS roaming, topology hiding, etc. at the NNI are not addressed in this test purpose specification. TDs have been only specified for requirements that are observable at the interface between two separate minimal IMS CN implementations, i.e. IMS NNI.

NOTE: Requirements which can only be observed at the interface between UE and IMS CN, i.e. home P-CSCF, are explicitly not within the scope of the present document. The latter requirements have been dealt with from a UE and conformance perspective in TS 134 229 [6].

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# 2 References

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

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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 124 229 (V6.13.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 124 229 version 6.13.0 Release 6)".

- [2] ETSI TS 186 011-1: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS NNI Interworking Test Specifications; Part 1: Test purposes for IMS NNI Interworking".
- [3] ETSI TS 102 351: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".
- [4] ETSI TS 102 237-1: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Interoperability test methods and approaches; Part 1: Generic approach to interoperability testing".
- [5] ETSI ES 202 553: "Methods for Testing and Specification (MTS); TPLan: A notation for expressing Test purposes".
- [6] ETSI TS 134 229 (V6.0.0): "Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Part 2: Implementation Conformance Statement (ICS) specification (3GPP TS 34.229-2 version 6.0.0 Release 6)".
- [7] ETSI TS 123 228 (V6.15.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228 version 6.15.0 Release 6)".
- [8] ETSI TS 133 203 (V6.10.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); 3G security; Access security for IP-based services (3GPP TS 33.203 version 6.10.0 Release 6)".
- [9] Void.
- [10] Void.
- [11] ETSI TS 123 060 (V6.15.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General Packet Radio Service (GPRS); Service description; Stage 2 (3GPP TS 23.060 version 6.15.0 Release 6)".
- [12] ETSI TS 127 060 (V6.0.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Packet domain; Mobile Station (MS) supporting Packet Switched services (3GPP TS 27.060 version 6.0.0 Release 6)".

## 2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [13] ETSI TR 133 978 (V6.6.0): "Universal Mobile Telecommunications System (UMTS); Security aspects of early IP Multimedia Subsystem (IMS) (3GPP TR 33.978 version 6.6.0 Release 6)".
- [14] ETSI TR 123 981 (V6.4.0): "Universal Mobile Telecommunications System (UMTS); Interworking aspects and migration scenarios for IPv4-based IP Multimedia Subsystem (IMS) implementations (3GPP TR 23.981 version 6.4.0 Release 6)".

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## 3 Abbreviations

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

3GPP	3 <sup>rd</sup> Generation Partnership Project
AS	(IMS) Application Server
CF	(Test) ConFiguRation
CFW	Call FloW
CN	Core Network
CSCF	Call Session Control Function

DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
HSS	Home Subscriber Server
I-CSCF	Interrogating CSCF
IMS	IP Multimedia Subsystem
IOI	Inter Operator Identifier
IP	Internet Protocol
NNI	Network-to-Network Interface
PCO	Point of Control and Observation
P-CSCF	Proxy CSCF
PO	POstable
PR	PReamble
PSTN	Public Switched Telephone Network
RQ	ReQUIREment
S-CSCF	Serving CSCF
SIP	Session Initiation Protocol
SDP	Session Description Protocol
SUT	System Under Test
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
TB	Test Body
TD	Test Description
TP	Test Purpose
TPLan	Test purpose Notation
TSS	Test Suite Structure
UC	Use Case
UE	User Equipment
URI	Uniform Record Identifier
VoIP	Voice over Internet Protocol
XML	Extensible Markup Language

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## 4 IMS NNI Interoperability Test Specification

### 4.1 Introduction

The IMS NNI Interoperability Test descriptions (TDs) defined in the following clauses are derived from the Test purposes (TPs) specified in [1].

### 4.2 Test prerequisites

#### 4.2.1 IP version

These test specifications are based on the use of IPv4 for SIP message transport throughout all IMS nodes [14].

#### 4.2.2 IP bearer establishment

##### 4.2.2.1 3GPP

3GPP bearer establishment procedures imply the creation of a PDP context over GPRS [11] and [12].

#### 4.2.3 Authentication and security

##### 4.2.3.1 3GPP

The current test specification supports standard 3GPP security, namely full IMS [8], early IMS [13] and optionally allows SIP Digest authentication without key agreement and null authentication.



## 4.2.4 Registration and subscription

### 4.2.4.1 SIP call flow

This clause describes the registration call flow under the authentication and security scope described in clause 4.2.2.

Depending on the security and authentication method used, the registration steps are:

1. *All*: The UE establishes an IP bearer as required by its specific access network.
2. *All*: Optional P-CSCF address discovery using the DHCP procedure.
3. *All*: The UE initiates IMS registration. IMS waits for the UE to send an initial REGISTER request.
4. *Full IMS, SIP Digest*: The IMS responds to the initial REGISTER request with a valid 401 unauthorized response.
5. *Full IMS*: The IMS and UE set up a temporary set of security associations.
6. *Full IMS, SIP Digest*: UE sends another REGISTER request (over the security associations for Full IMS).
7. *All*: The IMS responds to the REGISTER request with valid 200 OK responses (sent over the same temporary set of security associations that the UE used for sending the REGISTER request for Full IMS).
8. *All*: The IMS waits for the UE to send a SUBSCRIBE request (over the newly established security association for Full IMS).
9. *All*: The IMS responds to the SUBSCRIBE request with a valid 200 OK response.
10. *All*: The IMS sends a valid NOTIFY request for the subscribed registration event package.
11. *All*: The IMS waits for the UE to respond to the NOTIFY with a 200 OK response.

Expected sequence:

Step	Direction		Message	Comment
	UE	IMS		
2	←→			Optional P-CSCF address discovery using DHCP procedures for IPv4.
3	→		REGISTER	The UE sends initial registration for IMS services.
4	←		401 Unauthorized	<i>Full IMS, SIP Digest</i> : The IMS responds with a valid authentication challenge and security mechanisms supported by the network.
5	→		REGISTER	<i>Full IMS, SIP Digest</i> : The UE completes the security negotiation procedures (sets up a temporary set of security associations for Full IMS) and sends another REGISTER with authentication credentials.
6	←		200 OK	The IMS responds with 200 OK.
7	→		SUBSCRIBE	The UE subscribes to its registration event package.
8	←		200 OK	The IMS responds with 200 OK.
9	←		NOTIFY	The IMS sends initial NOTIFY for registration event package, containing full registration state information for the registered public user identity in the XML body.
10	→		200 OK	The UE responds with 200 OK.

## 4.2.5 Supported options

### 4.2.5.1 Security

"Early IMS" is the default security configuration in all test descriptions. Optional support for sec-agree when full IMS security is used. Tests may be executed with full IMS security if all required IMS nodes support it.

#### 4.2.5.2 Signalling compression

"No sigcomp" is the default signalling configuration in all test descriptions. Tests may be executed with signalling compression if the required nodes support it.

#### 4.2.5.3 Preconditions

"No precondition" is the default SDP configuration in all test descriptions. Tests may be executed with SDP preconditions if the required nodes support it.

#### 4.2.5.4 Reliable provisional responses

Reliable provisional responses (100rel) are the default signalling configuration in all test descriptions.

#### 4.2.5.5 Forking

Not applicable in the current test specification. However, support for forking is a requirement of the IMS specification.

### 4.3 Test infrastructure

In these clauses we define the involvement of the various IMS nodes specifically as they pertain to NNI testing. The configuration of the nodes is described. Points of control and observation are identified and static test configurations are described. The Mw interface is the interface under observation for NNI interoperability testing.

#### 4.3.1 Core IMS nodes

Because the current testing scope excludes IMS roaming and border control functionality, P-CSCF, S-CSCF, I-CSCF, and HSS are considered to be within a "black box" for testing purposes. We refer to this System Under Test (SUT) as "the minimal IMS". Interfaces within the IMS are considered internal and not observable for testing purposes. The use cases and test descriptions described below may be run with IMS roaming without modifications. However, no test descriptions are available that validate the operation of the Mw interface between the P-CSCF and S-CSCF as an NNI interface.

##### 4.3.1.1 P-CSCF

###### 4.3.1.1.1 Relevant interfaces

The P-CSCF constitutes the point of entry for UE signalling into the IMS core. The Gm interface between the P-CSCF and the UE is used as a point of control and observation (PCO) for NNI interoperability testing purposes. Although considered as internal and not explicitly involved in current NNI test configurations which exclude IMS roaming, it is recommended that the Mw interface between the P-CSCF and S-CSCF be exposed/available for troubleshooting purposes.

###### 4.3.1.1.2 Node configuration

The P-CSCF should be configured to support the pre-requisites outlined in clause 4.2.

##### 4.3.1.2 S-CSCF

###### 4.3.1.2.1 Relevant interfaces

The S-CSCF is the core IMS node delivering IMS services to subscribers. The Mw interface between the S-CSCF and either I- or S-CSCF in another domain is used as a point of observation against which NNI interoperability tests are validated. The Mw interfaces between I- and S-CSCFs within the same network are considered as internal IMS interfaces. Although considered as internal and not explicitly involved in current NNI test configurations which exclude IMS roaming, it is recommended that the Mw interface between the P-CSCF and S-CSCF be exposed for troubleshooting purposes.

### 4.3.1.2.2 Node configuration

The S-CSCF should be configured to support the pre-requisites outlined in clause 4.2. When applicable based on the specific configuration, the S-CSCF must be provisioned to support required Application Servers (AS) as trusted nodes.

### 4.3.1.3 HSS

#### 4.3.1.3.1 Relevant interfaces

The HSS constitutes the repository for IMS subscriber information. The Cx interface between the HSS and the S-CSCF and/or I-CSCF is considered an internal IMS interface.

#### 4.3.1.3.2 Node configuration

The HSS should be configured within the IMS to interact with CSCFs as required using DIAMETER Cx interfaces. For the purpose of this test specification, "ims\_a.net" refers to the domain served by "IMS\_A" and "ims\_b.net" refers to the domain served by "IMS\_B". Users should be provisioned to match the sample profiles listed in table 1. All public identities belong to the same implicitly registered set.

**Table 1: HSS sample user profiles**

IMS Domain	Private Identity	Public Identity 1	Public Identity 2	Default Public Identity	Filter criteria
ims_a.net	user_a1_priv@ims_a.net	sip:user_a1_pub@ims_a.net	na	1	na
ims_a.net	user_a2_priv@ims_a.net	sip:user_a2_pub@ims_a.net	tel:+33633348273	1	na
ims_a.net	user_a3_priv@ims_a.net	sip:user_a3_pub@ims_a.net	tel:+33633348274	2	na
ims_a.net	user_a4_priv@ims_a.net	sip:user_a4_pub@ims_a.net	na	1	terminating_unregistered/INVITE/ SESSION_TERMINATED/ as_a1.ims_a.net
ims_a.net	user_a5_priv@ims_a.net	sip:user_a5_pub@ims_a.net	na	1	
ims_b.net	user_b1_priv@ims_a.net	sip:user_b1_pub@ims_a.net	na	1	
ims_b.net	user_b2_priv@ims_a.net	sip:user_b2_pub@ims_a.net	tel:+44744459384	1	
ims_b.net	user_b3_priv@ims_a.net	sip:user_b3_pub@ims_a.net	tel:+44744459385	2	
ims_b.net	user_b4_priv@ims_a.net	sip:user_b4_pub@ims_a.net	na	1	terminating_unregistered/INVITE/ SESSION_TERMINATED/ as_b1.ims_b.net
ims_b.net	user_b5_priv@ims_a.net	sip:user_b5_pub@ims_a.net	na	1	

### 4.3.2 External IMS nodes

#### 4.3.2.1 UE

##### 4.3.2.1.1 Relevant interfaces

The UE is considered to act as a stimulus node in this test specification. The Gm interface between the P-CSCF and the UE is used as a point of control and observation (PCO) for NNI interoperability tests.

##### 4.3.2.1.2 Node configuration

The UE should be configured to support the pre-requisites outlined in clause 4.2.

## 4.3.2.2 AS

### 4.3.2.2.1 Relevant interfaces

The application server (AS) is considered to act as a stimulus node in this test specification. The ISC interface between the S-CSCF and the AS is used as a point of control and observation (PCO) for NNI interoperability tests.

### 4.3.2.2.2 Node configuration

The AS should be configured to support the pre-requisites outlined in clause 4.2.

## 4.3.3 Supporting IMS nodes

### 4.3.3.1 DNS

#### 4.3.3.1.1 Relevant interfaces

The Domain Name Service (DNS) is considered as a supporting entity in this test specification.

#### 4.3.3.1.2 Node configuration

DNS should be configured for appropriate resource record handling as required to support proper resolution of all SIP URIs in Request URIs and Route headers. In addition, DNS must support ENUM functionality in order to resolve Tel URIs into SIP URIs.

## 4.3.4 Test configurations

The following architectural test configurations are referenced in the IMS NNI interoperability TDs in the present document. They are intended to give a general rather than a specific view of the required IMS SUT(s) connectivity and associated UE(s), AS(s), and DNS(s).

The following guidelines are used to describe the test configurations:

- Named based convention defined in TS 123 228 [7] clause 5.5.1.
- Reuse the following abbreviations:
  - SS1: Different network operators performing origination and termination.
  - MO2: Mobile origination, home. The "Originating Network" of S-S#1 is therefore the home network.
  - ASO: Application Server origination. The "Originating Network" of S-S#1 is the home network.
  - MT2: Mobile termination, located in home service area. The "Terminating Network" of S-S#1 is the home network.
  - AST4: Termination at Application Server based on service logic.
- Exclude PSTN, non-IMS endpoints and IMS roaming since these are out of scope.
- Further differentiate IMS NNI observation points based on:
  - IN: initial request/response for a dialog.
  - SU: subsequent requests/responses in a dialog.
  - ST: standalone requests/response.

- and indicate:
  - observable interfaces as a solid line.
  - non-observable interfaces as dashed lines.

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/e0edaaad-9403-46b5-8b76-cc2b838c759b/etsi-ts-186-011-2-v1.0.0-2008-04>