

# ETSI TS 186 011-2 V2.1.1 (2009-02)

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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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## Reference

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 RTS/TISPAN-06033-2-NGN-R1

## Keywords

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 IMS, interworking, NNI, testing
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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 interoperability testing for the IP Multimedia Call Control Protocol based on Stage 3 Session Initiation Protocol (SIP) and Session Description Protocol (SDP) standard, TS 124 229 Release 7 [1]. TDs have been specified on the basis of the Test Purposes (TPs) and Test Suite Structure (TSS) presented in TS 124 229 [1]. TP fragments presented in the present document as part of TDs are defined using the TPLan notation of 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.

For the assessment of IMS core network requirements related to the ISC interface parts of the supplementary services HOLD (TS 124 410 [10]), CDIV (TS 124 404 [11]), ACR-CB (TS 124 411 [12]) and OIP/OIR (TS 124 407 [13]) have been used.

The scope of these test descriptions is not to cover all requirements specified in TS 124 229 [1]. TDs have been only specified for requirements that are observable at the interface between two IMS core network implementations, i.e. IMS NNI.

NOTE: Requirements pertaining to a UE or an AS implementation or IMS core network requirements that can only be observed at the interface between UE and IMS CN 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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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

## 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: "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 24.229 version 7.2.0 Release 7)".
- [2] ETSI TS 186 011-1 (V2.1.1): "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: "Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Part 1: Protocol conformance specification (3GPP TS 34.229-1 version 7.0.0 Release 7)".
- [7] ETSI TS 133 203: "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)".
- [8] IETF RFC 2617: "HTTP Authentication: Basic and Digest Access Authentication".
- [9] IETF RFC 2806: "URLs for Telephone Calls".
- [10] ETSI TS 124 410: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); TISPAN; NGN Signalling Control Protocol; Communication HOLD (HOLD) PSTN/ISDN simulation services; Protocol specification (3GPP TS 24.410 version 7.0.0 Release 7)".
- [11] ETSI TS 124 404: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); TISPAN; PSTN/ISDN simulation services: Communication Diversion (CDIV); Protocol specification (3GPP TS 24.404 version 7.0.0 Release 7)".
- [12] ETSI TS 124 411: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); TISPAN; PSTN/ISDN simulation services: Anonymous Communication Rejection (ACR) and Communication Barring (CB); Protocol specification (3GPP TS 24.411 version 7.0.0 Release 7)".
- [13] ETSI TS 124 407: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); TISPAN; PSTN/ISDN simulation services; Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR); Protocol specification (3GPP TS 24.407 version 7.0.0 Release 7)".

## 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.

- [i.1] ETSI TR 133 978: "Universal Mobile Telecommunications System (UMTS); Security aspects of early IP Multimedia Subsystem (IMS) (3GPP TR 33.978 version 6.6.0 Release 6)".
- [i.2] ETSI TR 123 981: "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)".



## 3 Abbreviations

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

3GPP	3 <sup>rd</sup> Generation Partnership Project
ACR	Anonymous Communication Rejection
AKA	Authentication and Key Agreement
AS	(IMS) Application Server
CB	Call Barring
CDIV	Call DIVersion
CF	(Test) Configuration
CFW	Call Flow
CN	Core Network
CSCF	Call Session Control Function
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
HOLD	Communication HOLD
HSS	Home Subscriber Server
IBCF	Interconnection Border Control Gateway
I-CSCF	Interrogating CSCF
IMS	IP Multimedia Subsystem
IOI	Inter Operator Identifier
IP	Internet Protocol
IPsec	Internet Protocol Security
ISC	IMS Service Control
NNI	Network-to-Network Interface
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
PCO	Point of Control and Observation
P-CSCF	Proxy CSCF
PO	Point of Observation
PSTN	Public Switched Telephone Network
SA	Security Association
S-CSCF	Serving CSCF
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SUT	System Under Test
TCP	Transmission Control Protocol
TD	Test Description
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
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

## 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 TS 186 011-1 [2]. The TDs cover both basic call procedures such as call establishment and call release and a selection of the most common supplementary services.

## 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 as specified in TR 123 981 [i.2].

### 4.2.2 Authentication and Security

The current test specification supports as default full IMS TS 133 203 [7] 3GPP security. Non-compliance with full IMS security features defined in TS 133 203 [7] is expected to be a problem mainly at the UE side, because of the potential lack of support of the USIM/ISIM interface (especially in 2G-only devices) and of the potential inability to support IPsec on some UE platforms. For those reasons, fallback to early IMS TR 133 978 [i.1] and SIP Digest authentication without key agreement and null authentication may be used to achieve satisfactory test results. Tests should however be executed with full IMS security if all required IMS nodes support it.

### 4.2.3 Registration and Subscription

#### 4.2.3.1 SIP Call Flow

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

##### 4.2.3.1.1 Early IMS Registration and Subscription Call Flow

Early IMS security does not allow SIP requests to be protected using an IPsec Security Association (SA) because it does not perform a key agreement procedure. IPsec security associations are not set up between UE and P-CSCF, as they are in the full IMS security solution. For early IMS security, the expected registration and subscription sequence is:

Step	Direction		Message	Comment
	UE	IMS		
1				The UE establishes an IP bearer as required by its specific access network (optional).
2	←→			P-CSCF address discovery using DHCP procedures for IPv4 (optional).
3	→		REGISTER	The UE sends initial registration for IMS services.
4	←		200 OK	The IMS responds with 200 OK.
5	→		SUBSCRIBE	The UE subscribes to its registration event package.
6	←		200 OK	The IMS responds with 200 OK.
7	←		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.
8	→		200 OK	The UE responds with 200 OK.

Unprotected

## 4.2.3.1.2 Full IMS Registration and Subscription Call Flow

For full IMS security, the expected registration and subscription sequence is:

Step	Direction		Message	Comment	
	UE	IMS			
1				The UE establishes an IP bearer as required by its specific access network (optional).	
2	↔			P-CSCF address discovery using DHCP procedures for IPv4 (optional).	
3	→		REGISTER	The UE sends initial registration for IMS services.	Unprotected
4	←		401 Unauthorized	The IMS responds with a valid Digest AKA authentication challenge and a list of integrity and encryption algorithms supported by the network as defined in the IMS AKA procedure of TS 133 203 [7].	
5				Upon receipt of 401 Unauthorized, the UE selects the first integrity and encryption algorithm combination on the list received from the P-CSCF in 401 Unauthorized which is also supported by the UE. If the P-CSCF did not include any confidentiality algorithm in 401 Unauthorized then the UE shall select the NULL encryption algorithm. The UE then proceeds to establish two new pairs of IPSEC security associations (SA1 and SA2).	
6	→		REGISTER	The UE sends another REGISTER with authentication credentials over IPSEC security association SA1.	Protected by SA1
7	←		200 OK	The IMS responds with 200 OK over the same IPSEC security association SA1.	
8	→		SUBSCRIBE	The UE subscribes to its registration event package over the IPSEC security association SA2.	Protected by SA2
9	←		200 OK	The IMS responds with 200 OK over the IPSEC security association SA2.	
10	←		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, over the IPSEC security association SA2.	
11	→		200 OK	The UE responds with 200 OK over the IPSEC security association SA2.	

### 4.2.3.1.3 SIP Digest Registration and Subscription Call Flow

For SIP Digest authentication without key agreement and null authentication, the expected registration and subscription sequence is:

Step	Direction		Message	Comment
	UE	IMS		
1				The UE establishes an IP bearer as required by its specific access network (optional).
2	↔			P-CSCF address discovery using DHCP procedures for IPv4 (optional).
3	→		REGISTER	The UE sends initial registration for IMS services.
4	←		401 Unauthorized	The IMS responds with a valid HTTP Digest authentication challenge as defined in RFC 2617 [8].
5	→		REGISTER	The UE 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.

Unprotected

## 4.2.4 Supported Options

### 4.2.4.1 Security

Support for security agreement is optional in case of Full IMS Reg. It shall only be used in case all IMS nodes support it.

### 4.2.4.2 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.

## 4.3 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 or the Ic interface if topology hiding is required 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, IBCF and HSS are considered to be within a "black box" for testing purposes, i.e. the System Under Test (SUT). Interfaces within the IMS are considered internal and not observable for testing purposes.

### 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. In the case of IMS roaming configurations where no topology hiding is applied the Mw interface of the P-CSCF is exposed at the NNI and used there as a Point of Observation (PO).

#### 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. When no topology hiding is applied, the Mw interface between the S-CSCF and either I- or S-CSCF in another network domain is used as a PO against which NNI interoperability tests are validated. The Mw interfaces between I- and S-CSCFs within the same network are considered to be internal IMS interfaces. Although considered as internal and not explicitly involved in all NNI test configurations, it is recommended that these interface are 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 I-CSCF

#### 4.3.1.3.1 Relevant Interfaces

The I-CSCF is the contact point within an operator's network for all connections destined to a user of that network operator or a roaming user currently located within that network operator's service area. When no topology hiding is applied, the Mw interface between the I-CSCF and an S-CSCF in another network domain is used as a PO against which NNI interoperability tests are validated. The Mw interfaces between I- and S-CSCFs within the same network are considered to be internal IMS interfaces. Although considered as internal and not explicitly involved in all NNI test configurations, it is recommended that these interface are exposed for troubleshooting purposes.

#### 4.3.1.3.2 Node Configuration

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

### 4.3.1.4 IBCF

The IBCF is the core IMS node providing topology hiding. When topology hiding is applied, the Ic interface between the IBCF and either IBCF or I- or S-CSCF in another network domain is used as a PO against which NNI interoperability tests are validated. The Mw interfaces between IBCF and I- or S-CSCFs within the same network are considered to be internal IMS interfaces. Although considered as internal and not explicitly involved in all NNI test configurations, it is recommended that these interfaces are exposed for troubleshooting purposes.

#### 4.3.1.4.1 Node Configuration

The IBCF should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the IBCF as part of an IMS core network depends highly on the test description to be executed. In case the requirement to support topology hiding is not explicitly stated in the pre-conditions of a test description it shall be assumed that the IBCF is not activated.