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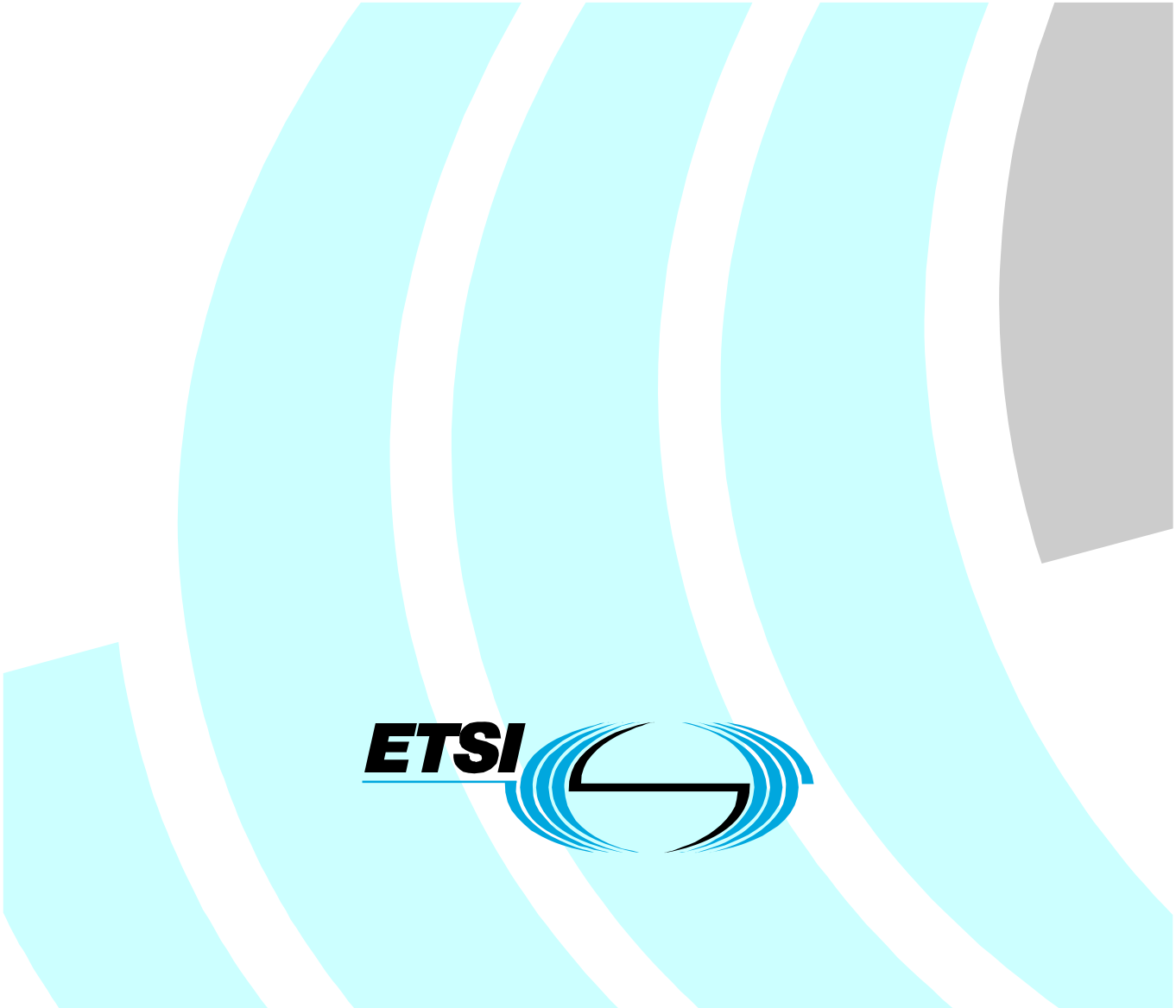
Technical Specification

Technical Committee for IMS Network Testing (INT);
IMS NNI Interworking Test Specifications;
Part 2: Test descriptions for IMS NNI Interworking



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Contents

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Foreword

This Technical Specification (TS) has been produced by IMS Network Testing (INT).

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";

Part 3: "ATS & PIXIT".

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, ES 283 003 [1]. TDs have been specified on the basis of the Test Purposes (TPs) and Test Suite Structure (TSS) presented in TS 186 011-1 [2]. 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 (see TS 124 410 [10]), CDIV (see TS 124 404 [11]), ACR-CB (see TS 124 411 [12]), and OIP/OIR (see TS 124 407 [13]) have been used.

The scope of these test descriptions is not to cover all requirements specified in ES 283 003 [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].

2 References

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

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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 ES 283 003 (V1.8.0): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified]".

[2] ETSI TS 186 011-1 (V2.0.0): "Technical Committee for IMS Network Testing (INT); 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 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 Release 7)".

[8] IETF RFC 2617: "HTTP Authentication: Basic and Digest Access Authentication".

[9] IETF RFC 3966: "The tel URI for Telephone Numbers".

[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 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 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 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 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 7.0.0 Release 7)".

[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 Release 7)".

3 Abbreviations

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

3GPP	3rd 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
CFU	Call Forward Unconditional
CFW	Call FloW
CN	Core Network
CSCF	Call Session Control Function
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
ENUM	E.164 Number Mapping
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
OCB	Outgoing Communication Barring
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.	Unprotected
4	←		200 OK	The IMS responds with 200 OK.	
5	→		SUBSCRIBE	The UE subscribes to its registration event package.	
6	←		200 OK or 202 Accepted	The IMS responds with 200 OK or 202 Accepted.	
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.	

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 or 202 Accepted	The IMS responds with 200 OK or 202 Accepted 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.	Unprotected
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 or 202 Accepted	The IMS responds with 200 OK or 202 Accepted.	
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.	

4.2.4 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

4.3.1.4.1 Relevant Interfaces

The IBCF is the core IMS node providing functionalities such as topology hiding, transport plane control or screening of SIP signalling. However, the IBCF can act also as a pass-through entity between adjacent IMS networks. 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.

4.3.1.4.2 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 and acts merely as a pass-through entity.

4.3.1.5 HSS

4.3.1.5.1 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.

4.3.1.5.2 Node Configuration

The HSS should be configured within each IMS participating in an interoperability test, i.e. IMS_A as well as IMS_B, to interact with CSCFs as required using DIAMETER Cx interfaces. Users should be provisioned to match the sample profiles listed in table 1. In addition, each IMS shall have its own unique domain. Also the phone numbers configured in the two IMSes participating in an interoperability test shall be unique, i.e. IMS_A and IMS_B shall have no phone numbers in common. All public identities belong to the same implicitly registered set.

Table 1: HSS sample user profiles

Private Identity	Public Identity 1 (SIP URI)	Public Identity 2 (Tel URI)	Default Public Identity	Filter criteria
userGEN_priv	userGEN	na	1	na
userSIP_priv	userSIP	e.g. tel:+330123402	1	na
userTEL_priv	userTEL	e.g. tel:+330123403	2	na
userNOAS_priv	userNOAS	na	1	contact AS on terminating INVITE SESSION_TERMINATED
userHOLD_priv	userHOLD	na	1	contact HOLD AS
userOIP_priv	userOIP	na	1	contact OIP AS
userOIR_priv	userOIR	na	1	contact OIR AS
userACR_priv	userACR	na	1	contact ACR AS
userCFU_priv	userCFU	na	1	contact CFU AS

Public user identity may take the form of SIP or TEL URIs (RFC 3966 [9]).

EXAMPLE 1: sip: userGEN@ims_a.net.

EXAMPLE 2: tel: +330123402.

A private user identity may also take the form of- <imsi>@ims.<xxx>mnc.<yyy>.mcc.3gppnetwork.org.

EXAMPLE 3: 293410100367663@ims.041mnc.293.mcc.3gppnetwork.org.

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. The test descriptions in the present document assume that a UE supports basic call and messaging functionality, target refresh based on UPDATE and on re-INVITE method, message transport via UDP and TCP, and the use of at least one of the supplementary services HOLD (see TS 124 410 [10]), CDIV (see TS 124 404 [11]), ACR-CB (see TS 124 411 [12]) or OIP/OIR (see TS 124 407 [13]). In the case that a UE does not meet one or more of these features, only a selected subset of the test descriptions in this document should be used for IMS core network interoperability testing, i.e. test descriptions which do not contain any pass criteria related to these features.

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. The test descriptions in the present document assume that an AS supports the use of the supplementary services HOLD (see TS 124 410 [10]), CDIV (see TS 124 404 [11]), ACR-CB (see TS 124 411 [12]), and OIP/OIR (see TS 124 407 [13]). In the case that an AS does not support one or more of these supplementary services, only a selected subset of the test descriptions in the present document should be used for IMS core network interoperability testing, i.e. test descriptions which do not contain any pass criteria related to these supplementary services.

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. It is assumed that each IMS has its own local DNS which is connected to the common interconnect DNS.

4.3.3.1.2 Node Configuration

The common 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, either the local or common DNS must support ENUM functionality in order to resolve Tel URIs into SIP URIs. As an example, a DNS should have an entry to map E.164 number 0633348273 to the SIP URI of userSIP.

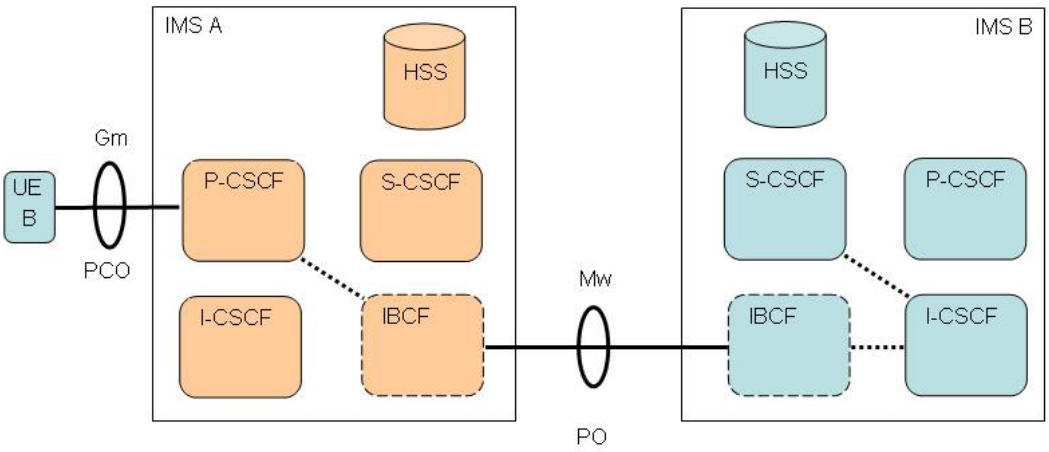
4.3.4 Test Configurations

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 core network SUT(s) connectivity and associated UE(s), AS(s), and DNS(s).

NOTE: Note that in the following figures observable interfaces are indicated as a solid line, non-observable interfaces indicated as dashed lines, and IBCFs are assumed to act in a "pass-through" mode if topology hiding is not required by a test description. In addition, local DNS servers are not shown.

Roaming Registration

CF_ROAM_REG

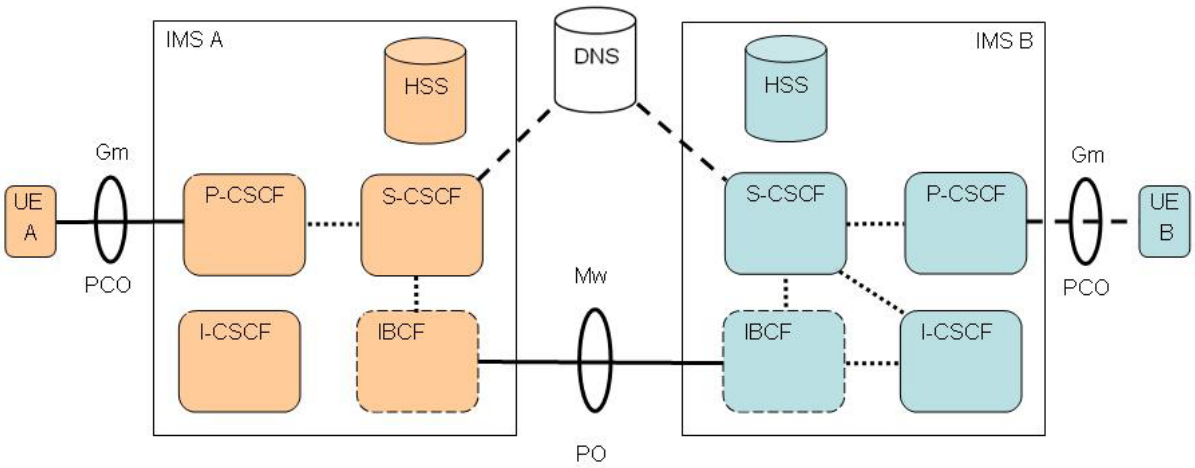


Precondition:
Different network operators performing origination and termination, UE_B roaming in Home network A (ROAM), UE_B not yet registered (REG), neither UE_A nor AS involved, IBCF may be involved
Test configuration for:
Registration requests and responses from UE_B
Example:
REGISTER prior to IMS VoIP voice call from UE_B

Figure 1: CF_ROAM_REG

Interworking Call

CF_INT_CALL

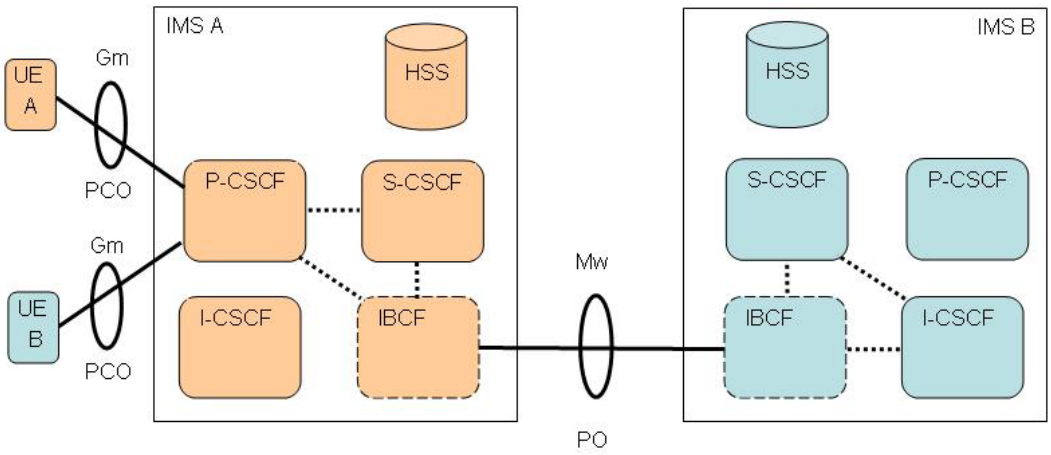


Precondition:
Different network operators performing origination and termination, both UEs or only UE A in home networks (INT), both UE's registered, no AS, a common interconnect DNS and local DNSs for each IMS may be involved, IBCF may be involved
Test configuration for:
Requests and responses between UE_A and UE_B in call (CALL) and messaging scenarios
Unsuccessful initial requests and responses from UE_A (when UE_B is not registered)
Example:
Initial INVITE in IMS VoIP voice call from UE_A to UE_B

Figure 2: CF_INT_CALL

Roaming Call

CF_ROAM_CALL

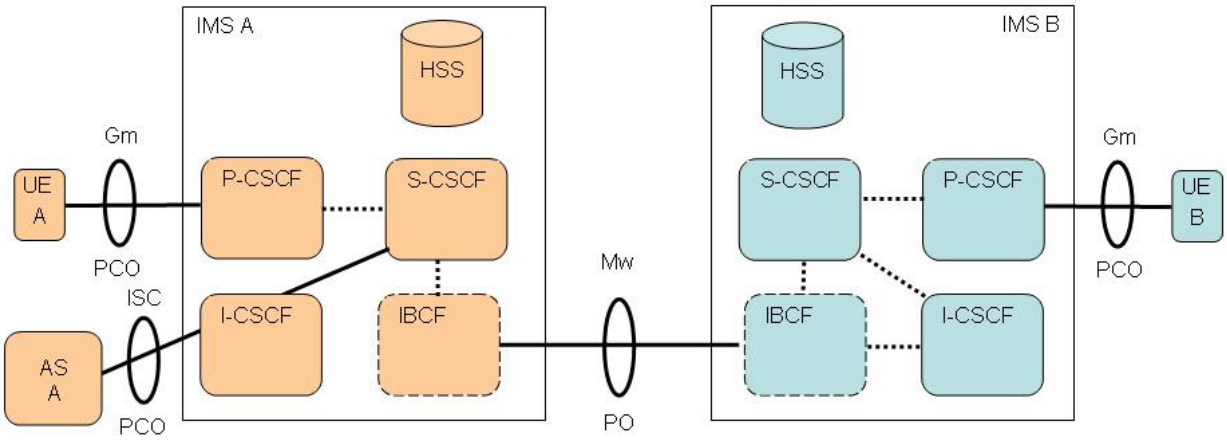


Precondition:
Different network operators performing origination and termination, UE_B roaming (ROAM) via IMS_A, UE_A in home network, both UEs are registered, no AS, IBCF may be involved
Test configuration for:
Requests and responses between UEB and UE_A in call (CALL) and messaging scenarios
Example:
Initial INVITE in IMS VoIP voice call from UE_B to UE_A

Figure 3: CF_ROAM_CALL

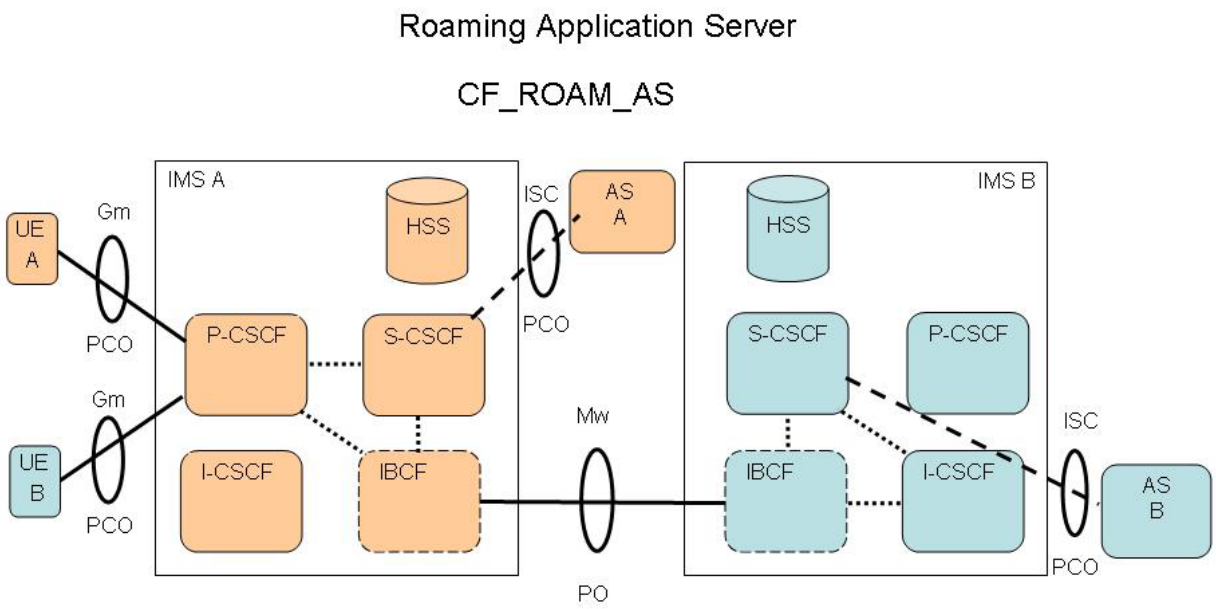
Interworking Application Server

CF_INT_AS



Precondition:
Different network operators performing origination and termination, UE_A and UE_B in home networks (INT), both UEs registered, only AS for UE_A (AS), IBCF may be involved
Test configuration for:
Requests and responses between AS_A and UEs
Example:
Initial INVITE in IMS VoIP voice call unconditionally forwarded to UE_B by AS_A (CFU). AS_A acts as routing AS

Figure 4: CF_INT_AS



Precondition:
Different network operators performing origination and termination, UE_B roaming (ROAM) via IMS_A, UE_A in home network, both UEs or registered, AS for UE_A and UE B may be involved (AS), IBCF may be involved
Test configuration for:
Requests and responses between AS_B and UEs
Unsuccessful initial requests and responses from UE_A (when UE_B and AS_B are not available)
Example:
Initial INVITE IMS VoIP voice call unconditionally forwarded to UE_B by AS_B (CFU). AS_B acts as routing AS

Figure 5: CF_ROAM_AS

4.4 Use Cases

Use cases are the basis for interoperability test descriptions. Each use case defines both a generic test sequence, i.e. a set of user stimuli and observations for any number of involved IMS external entities (IMS UE, DNS Server, and AS), and a monitor view of all the resulting messages exchanged at the outer IMS core network interfaces, i.e. a call flow for user, Gm, Mw, Ic, DNS, and ISC interfaces. The test sequence and call flow are correlated using grey shading.

For call and messaging related use cases presented in this clause that involve UE interaction it is assumed to follow the registration and subscription procedure described in clause 4.2.4 for each UE involved in the test. These procedures are not shown here to reduce the size of the call flows.

Test descriptions defined in clause 4.5 then reference and specialize one of the use cases presented in this clause, i.e. generic test sequence and call flow, according to the needs of the one or more test purposes which are associated with a test description.

4.4.1 IMS Registration in a Visited Network

4.4.1.1 Description

UE_B registers in a visiting network. The call flow path and node configuration for this use case corresponds to CF_ROAM_REG.

The test sequence typically associated with this use case when an established session is released is as follows (CFW step numbers refer the call flow step numbering).

Step	Action	CF_ROAM_REG
1	User B triggers registration to IMS B	Step 1
2	User B is informed about successful registration	Step 22

4.4.1.2 UC_01_R: SIP message flow for IMS registration with CF ROAM

The expected call flow sequence is:

Step	Direction	Message	Comment
	User B / UE B / IMS A / IMS B		
1	UE B →		User B triggers registration to IMS B
2	UE B → IMS A	REGISTER	UE_B sends a REGISTER to IMS_A
3	IMS A → IMS B	REGISTER	IMS_A forwards the REGISTER to IMS_B
4	IMS A ← IMS B	401 Unauthorized	IMS_B responds with 401 Unauthorized to IMS_A
5	UE B ← IMS A	401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
6	UE B → IMS A	REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
7	IMS A → IMS B	REGISTER	IMS_A forwards the REGISTER to IMS B
8	IMS A ← IMS B	200 OK	IMS_B responds with 200 OK
9	UE B ← IMS A	200 OK	IMS_A forwards the 200 OK response to UE_B
10	IMS A → IMS B	SUBSCRIBE	IMS_A sends a SUBSCRIBE to IMS_B
11	IMS A ← IMS B	200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
12	IMS A ← IMS B	NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
13	IMS A → IMS B	200 OK	IMS_A responds to the NOTIFY with a 200 OK
14	UE B → IMS A	SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
15	IMS A → IMS B	SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IMS_B
16	IMS A ← IMS B	200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
17	UE B ← IMS A	200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
18	IMS A ← IMS B	NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
19	UE B ← IMS A	NOTIFY	IMS_A forwards the NOTIFY to UE_B
20	UE B → IMS A	200 OK	UE_B responds to the NOTIFY with a 200 OK
21	IMS A → IMS B	200 OK	IMS_A forwards the 200 OK to IMS_B
22	User B ← UE B		User B is informed about successful registration

4.4.2 User-initiated VoIP call setup and release

4.4.2.1 Normal Call

4.4.2.1.1 Description

UE_A places an IMS VoIP call to UE_B. Once the media path is established, the originating user releases the call. The call flow path and node configuration for this use case corresponds to CF_INT_CALL in case of interworking and CF_ROAM_CALL in case of roaming.

The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering).

4.4.2.1.2 UC_02_I: SIP Call Flow "Normal Call" with CF_INT_CALL

The test sequence and expected call flow sequence when user A calls user B in an interworking scenario is:

Step	Action	CF_INT_CALL
1	User A calls User B	Step 1
2	User B is informed of incoming call of User A	Step 8
3	User A is informed that UE_B is ringing	Step 12
4	User B answers call	Step 13
5	User A is informed that call has been answered	Step 17
6	User B is informed that the call is established	Step 21
7A	User A ends call	Step 22A
7B	User B ends call	Step 22B
8A	User B is informed that call has ended	Step 26A
8B	User A is informed that call has ended	Step 26B
9A	User A is informed that call has ended	Step 30A
9B	User B is informed that call has ended	Step 30B

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A calls User B
2		→	→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←	←				100 Trying	IMS_A responds with a 100 Trying provisional response
4			→	→			INVITE	IMS_A forwards INVITE to IMS_B
5			←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
6				→	→		INVITE	IMS_B forwards INVITE to UE_B
7				←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
8					→	→		User B is informed of incoming call of User A
9				←	←		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←	←			180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11		←	←				180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←	←						User A is informed that UE_B is ringing
13					←	←		User B answers call
14				←	←		200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
15			←	←			200 OK	IMS_B forwards 200 OK response to IMS_A
16		←	←				200 OK	IMS_A forwards the 200 OK response to UE_A
17	←	←						User A is informed that call has been answered
18		→	→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19			→	→			ACK	IMS_A forwards ACK to IMS_B
20				→	→		ACK	IMS_B forwards ACK to UE_B
21					→	→		User B is informed that the call is established
22A	→	→						User A ends call
23A		→	→				BYE	UE_A releases the call with BYE
24A			→	→			BYE	IMS_A forwards BYE to IMS_B
25A				→	→		BYE	IMS_B forwards BYE to UE_B

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
26A					→			User B is informed that call has ended
27A				←			200 OK	UE_B sends 200 OK for BYE
28A			←				200 OK	IMS_B forwards 200 OK response to IMS_A
29A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
30A	←							User A is informed that call has ended
22B					←			User B ends call
23B				←			BYE	UE_B releases the call with BYE
24B			←				BYE	IMS_B forwards BYE to IMS_A
25B		←					BYE	IMS_A forwards BYE to UE_A
26B	←							User A is informed that call has ended
27B		→					200 OK	UE_A sends 200 OK for BYE
28B			→				200 OK	IMS_A forwards 200 OK response to IMS_B
29B				→			200 OK	IMS_B forwards the 200 OK response to UE_B
30B					→			User B is informed that call has ended

4.4.2.1.3 UC_02_R: SIP Call Flow "Normal Call" with CF_ROAM_CALL

The expected call flow sequence when user A calls user B in a roaming scenario is:

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
1	→							User A calls User B
2		→			→		INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4					→		INVITE	IMS_A forwards INVITE to IMS_B
5					←		100 Trying	IMS_B responds with a 100 Trying provisional response
6					←		INVITE	IMS_B forwards the INVITE to IMS_A
7					→		100 Trying	IMS_A responds with a 100 Trying provisional response
8				←			INVITE	IMS_A forwards the INVITE to UE_B
9				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
10			←					User B is informed of incoming call of User A
11				→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12					→		180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
15	←							User A is informed that UE_B is ringing
16			→					User B answers call
17				→			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
18					→		200 OK	IMS_A forwards 200 OK response to IMS_B
19					←		200 OK	IMS_B forwards the 200 OK response to IMS_A
20		←					200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
21	←							User A is informed that call has been answered
22		→			→		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
23					→		ACK	IMS_A forwards ACK to IMS_B
24					←		ACK	IMS_B forwards ACK to IMS_A
25				←			ACK	IMS_A forwards ACK to UE_B
26			←					User B is informed that the call is established
27A	→							User A ends call
28A		→			→		BYE	UE_A releases the call with BYE
29A					→		BYE	IMS_A forwards BYE to IMS_B
30A					←		BYE	IMS_B forwards BYE to IMS_A
31A				←			BYE	IMS_A forwards BYE to UE_B
32A			←					User B is informed that call has ended
33A				→			200 OK	UE_B sends 200 OK for BYE
34A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
35A					←		200 OK	IMS_B forwards the 200 OK response to IMS_A
36A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
37A	←							User A is informed that call has ended
27B			→					User B ends call
28B				→			BYE	UE_B releases the call with BYE
29B					→		BYE	IMS_A forwards BYE to IMS_B
30B					←		BYE	IMS_B forwards BYE to IMS_A
31B		←					BYE	IMS_A forwards BYE to UE_A
32B	←							User A is informed that call has ended
33B		→			→		200 OK	UE_A sends 200 OK for BYE
34B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
35B					←		200 OK	IMS_B forwards the 200 OK response to IMS_A
36B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
37B			←					User B is informed that call has ended

The test sequence and expected call flow sequence when user B calls user A in a roaming scenario is:

Step	Action	CF_ROAM_CALL
1	User B calls User A	Step 1
2	User A is informed of incoming call of User B	Step 10
3	User B is informed that UE_A is ringing	Step 15
4	User A answers call	Step 16
5	User B is informed that call has been answered	Step 21
6	User A is informed that the call is established	Step 26
7A	User A ends call	Step 27A
7B	User B ends call	Step 27B
8A	User B is informed that call has ended	Step 32A
8B	User A is informed that call has ended	Step 32B
9A	User A is informed that call has ended	Step 37A
9B	User B is informed that call has ended	Step 37B

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
1			←					User B calls User A
2				→	→		INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3				←	←		100 Trying	IMS_A responds with a 100 Trying provisional response
4					→	→	INVITE	IMS_A forwards INVITE to IMS_B
5					←	←	100 Trying	IMS_B responds with a 100 Trying provisional response
6					←	←	INVITE	IMS_B forwards the INVITE to IMS_A
7					→	→	100 Trying	IMS_A responds with a 100 Trying provisional response
8		←		←	←		INVITE	IMS_A forwards the INVITE to UE_A
9		→		→	→		100 Trying	UE_A optionally responds with a 100 Trying provisional response
10	←	←						User A is informed of incoming call of User B
11		→		→	→		180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12					→	→	180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←	←	180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14				←	←		180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
15			←	←				User B is informed that UE_A is ringing
16	→	→						User A answers call
17		→		→	→		200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
18					→	→	200 OK	IMS_A forwards 200 OK response to IMS_B
19					←	←	200 OK	IMS_B forwards the 200 OK response to IMS_A
20				←	←		200 OK	IMS_A forwards the 200 OK response to UE_B
21			←	←				User B is informed that call has been answered
22				→	→		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
23					→	→	ACK	IMS_A forwards ACK to IMS_B
24					←	←	ACK	IMS_B forwards ACK to IMS_A
25		←		←	←		ACK	IMS_A forwards ACK to UE_A
26	←	←						User A is informed that the call is established
27A	→	→						User A ends call
28A		→		→	→		BYE	UE_A releases the call with BYE
29A					→	→	BYE	IMS_A forwards BYE to IMS_B
30A					←	←	BYE	IMS_B forwards BYE to IMS_A
31A				←	←		BYE	IMS_A forwards BYE to UE_B
32A			←	←				User B is informed that call has ended
33A				→	→		200 OK	UE_B sends 200 OK for BYE
34A					→	→	200 OK	IMS_A forwards 200 OK response to IMS_B
35A					←	←	200 OK	IMS_B forwards the 200 OK response to IMS_A
36A		←		←	←		200 OK	IMS_A forwards the 200 OK response to UE_A
37A	←	←						User A is informed that call has ended
27B			→					User B ends call
28B				→	→		BYE	UE_B releases the call with BYE
29B					→	→	BYE	IMS_A forwards BYE to IMS_B
30B					←	←	BYE	IMS_B forwards BYE to IMS_A
31B		←		←	←		BYE	IMS_A forwards BYE to UE_A
32B	←	←						User A is informed that call has ended

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
33B							200 OK	UE_A sends 200 OK for BYE
34B							200 OK	IMS_A forwards 200 OK response to IMS_B
35B							200 OK	IMS_B forwards the 200 OK response to IMS_A
36B							200 OK	IMS_A forwards the 200 OK response to UE_B
37B								User B is informed that call has ended

4.4.3 User-initiated call hold and resume

UE_A places an IMS VoIP call to UE_B. Once the media path is established:

a) The originating user puts the call on hold, stopping the media stream. The originating user then resumes the call.

b) The terminating user puts the call on hold, stopping the media stream. The terminating user then resumes the call.

The call flow path and node configuration for this use case corresponds to CF_INT_CALL in case of interworking and CF_ROAM_CALL in case of roaming.

Depending on the UE this feature may be implemented either using reINVITE or UPDATE where UPDATE is only an optional feature for the UE. However, an IMS shall be able to process UPDATE requests as they may be received when inter working with a PSTN.

4.4.3.1 User-initiated call hold and resume using reINVITE

4.4.3.1.1 Description

The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_INT_CALL	CF_ROAM_CALL
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	8	10
3	User A is informed that UE_B is ringing	12	15
4	User B answers call	13	16
5	User A is informed that call has been answered	17	21
6	User B is presented that call is established	27	26
7A	User A puts call on hold	22A	27A
7B	User B puts call on hold	22B	27B
8A	User B is informed that call on hold	29A	36A
8B	User A is informed that call on hold	29B	36B
9A	User A resumes call	36A	45A
9B	User B resumes call	36B	45B
10A	User B is informed that call is resumed	43A	54A
10B	User A is informed that call is resumed	43B	54A
11A	User A is informed that call is resumed	47A	59A
11B	User B is informed that call is resumed	47B	59B
12	User A ends call	51	64
13	User B is informed that call has ended	55	69
14	User A is informed that call has ended	59	73

4.4.3.1.2 UC_03_I: SIP Call Flow "call hold and resume" using reINVITE with CF_INT_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1		→						User A calls User B
2			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3			←				100 Trying	IMS_A responds with a 100 Trying provisional response
4				→			INVITE	IMS_A forwards INVITE to IMS_B
5				←			100 Trying	IMS_B responds with a 100 Trying provisional response
6					→		INVITE	IMS_B forwards INVITE to UE_B
7					←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
8						→		User B is informed of incoming call of User A
9					←		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10				←			180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11			←				180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13					←			User B answers call
14					←		200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
15				←			200 OK	IMS_B forwards 200 OK response to IMS_A
16			←				200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18			→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19				→			ACK	IMS_A forwards ACK to IMS_B
20					→		ACK	IMS_B forwards ACK to UE_B
21						→		User B is presented that call is in progress
22A		→						User A puts call on hold
23A			→				INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
24A			←				100 Trying	IMS_A responds with a 100 Trying provisional response
25A				→			INVITE	IMS_A forwards INVITE to IMS_B
26A				←			100 Trying	IMS_B responds with a 100 Trying provisional response
27A					→		INVITE	IMS_B forwards INVITE to UE_B
28A					←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
29A						→		User B is informed that call is on hold
30A					←		200 OK	UE_B responds to reINVITE with 200 OK indicating media attribute "recvonly"
31A				←			200 OK	IMS_B forwards 200 OK response to IMS_A
32A			←				200 OK	IMS_A forwards the 200 OK response to UE_A
33A			→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
34A				→			ACK	IMS_A forwards ACK to IMS_B
35A					→		ACK	IMS_B forwards ACK to UE_B
36A		→						User A resumes call

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
37A		→	→				INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
38A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
39A			→	→			INVITE	IMS_A forwards INVITE to IMS_B
40A			←				100 Trying	IMS_B responds with a 100 Trying provisional response
41A				→	→		INVITE	IMS_B forwards INVITE to UE_B
42A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
43A						→		User B is informed that call is resumed
44A					←		200 OK	UE_B responds to reINVITE with 200 OK indicating media attribute "recvonly"
45A				←			200 OK	IMS_B forwards 200 OK response to IMS_A
46A			←				200 OK	IMS_A forwards the 200 OK response to UE_A
47A	←							User A is informed that call is resumed
48A		→	→				ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
49A			→	→			ACK	IMS_A forwards ACK to IMS_B
50A				→	→		ACK	IMS_B forwards ACK to UE_B
22B					←			User B puts call on hold
23B				←			INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
24B				→			100 Trying	IMS_B responds with a 100 Trying provisional response
25B			←				INVITE	IMS_B forwards INVITE to IMS_A
26B			→				100 Trying	IMS_A responds with a 100 Trying provisional response
27B		←					INVITE	IMS_A forwards INVITE to UE_A
28B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
29B	←							User A is informed that call is on hold
30B		→	→				200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
31B			→	→			200 OK	IMS_A forwards 200 OK response to IMS_B
32B				→	→		200 OK	IMS_B forwards the 200 OK response to UE_B
33B				←			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
34B			←				ACK	IMS_B forwards ACK to IMS_A
35B		←					ACK	IMS_A forwards ACK to UE_A
36B					←			User B resumes call
37B				←			INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
38B				→			100 Trying	IMS_B responds with a 100 Trying provisional response
39B			←				INVITE	IMS_B forwards INVITE to IMS_A
40B			→				100 Trying	IMS_A responds with a 100 Trying provisional response
41B		←					INVITE	IMS_A forwards INVITE to UE_A
42B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
43B	←							User A is informed that call is resumed
44B		→	→				200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "sendrecv"
45B			→	→			200 OK	IMS_A forwards 200 OK response to IMS_B
46B				→	→		200 OK	IMS_B forwards the 200 OK response to UE_B
47B					→	→		User B is informed that call is resumed

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
48B				←			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
49B			←				ACK	IMS_B forwards ACK to IMS_A
50B		←					ACK	IMS_A forwards ACK to UE_A
51	→							User A ends call
52		→					BYE	UE_A releases the call with BYE
53			→				BYE	IMS_A forwards BYE to IMS_B
54				→			BYE	IMS_B forwards BYE to UE_B
55					→			User B is informed that call has ended
56				←			200 OK	UE_B sends 200 OK for BYE
57			←				200 OK	IMS_B forwards 200 OK response to IMS_A
58		←					200 OK	IMS_A forwards the 200 OK response to UE_A
59	←							User A is informed that call has ended

4.4.3.1.3 UC_03_R: SIP Call Flow "call hold and resume" using reINVITE with CF_ROAM_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
1	→							User A calls User B
2		→			→		INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←		100 Trying	IMS_A responds with a 100 Trying provisional response
4						→	INVITE	IMS_A forwards INVITE to IMS_B
5					←		100 Trying	IMS_B responds with a 100 Trying provisional response
6					←		INVITE	IMS_B forwards INVITE to IMS_A
7						→	100 Trying	IMS_A responds with a 100 Trying provisional response
8				←	←		INVITE	IMS_A forwards INVITE to UE_B
9				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
10			←					User B is informed of incoming call of User A
11				→	→		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12						→	180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14		←			←		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
15	←							User A is informed that UE_B is ringing
16			→					User B answers call
17				→			200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
18					→		200 OK	IMS_A forwards 200 OK response to IMS_B
19					←		200 OK	IMS_B forwards 200 OK response to IMS_A
20		←			←		200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
21	←							User A is informed that call has been answered
22		→		→			ACK	UE_A acknowledges the receipt of 200 OK for INVITE
23					→		ACK	IMS_A forwards ACK to IMS_B
24					←		ACK	IMS_B forwards ACK to IMS_A
25				←			ACK	IMS_A forwards ACK to UE_B
26			←					User B is presented that call is established
27A	→							User A puts call on hold
28A		→		→			INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
29A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
30A					→		INVITE	IMS_A forwards INVITE to IMS_B
31A					←		100 Trying	IMS_B responds with a 100 Trying provisional response
32A					←		INVITE	IMS_B forwards INVITE to IMS_A
33A					→		100 Trying	IMS_A responds with a 100 Trying provisional response
34A				←			INVITE	IMS_A forwards INVITE to UE_B
35A				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
36A			←					User B is informed that call is on hold
37A				→			200 OK	UE_B responds to reINVITE with 200 OK indicating media attribute "recvonly"
38A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
39A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
40A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
41A		→		→			ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
42A					→		ACK	IMS_A forwards ACK to IMS_B
43A					←		ACK	IMS_B forwards ACK to IMS_A
44A				←			ACK	IMS_A forwards ACK to UE_B
45A	→							User A resumes call
46A		→		→			INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
47A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
48A					→		INVITE	IMS_A forwards INVITE to IMS_B
49A					←		100 Trying	IMS_B responds with a 100 Trying provisional response
50A					←		INVITE	IMS_B forwards INVITE to IMS_A
51A					→		100 Trying	IMS_A responds with a 100 Trying provisional response
52A				←			INVITE	IMS_A forwards INVITE to UE_B
53A				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
54A			←					User B is informed that call is resumed
55A				→			200 OK	UE_B responds to reINVITE with 200 OK indicating media attribute "sendrecv"
56A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
57A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
58A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
59A	←							User A is informed that call is resumed
60A		→		→			ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
61A					→		ACK	IMS_A forwards ACK to IMS_B
62A					←		ACK	IMS_B forwards ACK to IMS_A

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
63A				←			ACK	IMS_A forwards ACK to UE_B
27B			→					User B puts call on hold
28B				→			INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
290 B				←			100 Trying	IMS_A responds with a 100 Trying provisional response
30B					→		INVITE	IMS_A forwards INVITE to IMS_B
31B					←		100 Trying	IMS_B responds with a 100 Trying provisional response
32B					←		INVITE	IMS_B forwards INVITE to IMS_A
33B					→		100 Trying	IMS_A responds with a 100 Trying provisional response
34B		←					INVITE	IMS_A forwards INVITE to UE_A
35B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
36B	←							User A is informed that call is on hold
37B		→					200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
38B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
39B					←		200 OK	IMS_B forwards 200 OK response to IMS_A
40B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
41B				→			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
42B					→		ACK	IMS_A forwards ACK to IMS_B
43B					←		ACK	IMS_B forwards ACK to IMS_B
44B		←					ACK	IMS_A forwards ACK to UE_A
45B			→					User B resumes call
46B				→			INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
47B				←			100 Trying	IMS_A responds with a 100 Trying provisional response
48B					→		INVITE	IMS_A forwards INVITE to IMS_B
49B					←		100 Trying	IMS_B responds with a 100 Trying provisional response
50B					←		INVITE	IMS_B forwards INVITE to IMS_A
51B					→		100 Trying	IMS_A responds with a 100 Trying provisional response
52B		←					INVITE	IMS_A forwards INVITE to UE_A
53B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
54B	←							User A is informed that call is resumed
55B		→					200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "sendrecv"
56B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
57B					←		200 OK	IMS_B forwards 200 OK response to IMS_A
58B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
59B			←					User B is informed that call is resumed
60B				→			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
61B					→		ACK	IMS_A forwards ACK to IMS_B
62B					←		ACK	IMS_B forwards ACK to IMS_A
63B		←					ACK	IMS_A forwards ACK to UE_A
64	→							User A ends call
65		→					BYE	UE_A releases the call with BYE
66					→		BYE	IMS_A forwards BYE to IMS_B
67					←		BYE	IMS_B forwards BYE to IMS_B

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
68				←			BYE	IMS_B forwards BYE to UE_B
69			←					User B is informed that call has ended
70				→			200 OK	UE_B sends 200 OK for BYE
71					→		200 OK	IMS_A forwards 200 OK response to IMS_B
72					←		200 OK	IMS_B forwards 200 OK response to IMS_A
73		←					200 OK	IMS_A forwards the 200 OK response to UE_A
74	←							User A is informed that call has ended

4.4.3.2 User-initiated call hold and resume using UPDATE

4.4.3.2.1 Description

The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_INT_CALL	CF_ROAM_CALL
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	8	10
3	User A is informed that UE_B is ringing	12	15
4	User B answers call	13	16
5	User A is informed that call has been answered	17	21
6	User B is informed that call is established	21	26
7A	User A puts call on hold	22A	27A
7B	User B puts call on hold	22B	27B
8A	User B is informed that call on hold	26A	32A
8B	User A is informed that call on hold	26B	32B
9A	User A resumes call	30A	37A
9B	User B resumes call	30B	37B
10A	User B is informed that call is resumed	34A	42A
10B	User A is informed that call is resumed	34B	42B
11A	User A is informed that call is resumed	38A	47A
11	User A is informed that call is resumed	38B	47B
12	User A ends call	39	48
13	User B is informed that call has ended	43	53
14	User A is informed that call has ended	47	58

4.4.3.2.2 UC_04_I: SIP Call Flow "call hold and resume" using UPDATE with CF_INT_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1		→						User A calls User B
2			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3			←				100 Trying	IMS_AW responds with a 100 Trying provisional response
4				→			INVITE	IMS_A forwards INVITE to IMS_B

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6				→			INVITE	IMS_B forwards INVITE to UE_B
7				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
8					→			User B is informed of incoming call of User A
9				←			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13					←			User B answers call
14				←			200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
15			←				200 OK	IMS_B forwards 200 OK response to IMS_A
16		←					200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19			→				ACK	IMS_A forwards ACK to IMS_B
20				→			ACK	IMS_B forwards ACK to UE_B
21					→			User B is informed that call is established
22A	→							User A puts call on hold
23A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
24A			→				UPDATE	IMS_A forwards UPDATE to IMS_B
25A				→			UPDATE	IMS_B forwards UPDATE to UE_B
26A					→			User B is informed that call is on hold
27A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
28A			←				200 OK	IMS_B forwards 200 OK response to IMS_A
29A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
30A	→							User A resumes call
31A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
32A			→				UPDATE	IMS_A forwards UPDATE to IMS_B
33A				→			UPDATE	IMS_B forwards UPDATE to UE_B
34A					→			User B is informed that call is resumed
35A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
36A			←				200 OK	IMS_B forwards 200 OK response to IMS_A
37A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
38A	←							User A is informed that call is resumed
22B					←			User B puts call on hold
23B				←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
24B			←				UPDATE	IMS_B forwards UPDATE to IMS_A
25B		←					UPDATE	IMS_A forwards UPDATE to UE_A
26B	←							User A is informed that call on hold
27B		→					200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "recvonly"
28B			→				200 OK	IMS_A forwards 200 OK response to IMS_B
29B				→			200 OK	IMS_B forwards the 200 OK response to UE_B
30B					←			User B resumes call

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
31B					←		UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
32B				←			UPDATE	IMS_B forwards UPDATE to IMS_A
33B			←				UPDATE	IMS_A forwards UPDATE to UE_A
34B		←						User A is informed that call is resumed
35B			→				200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
36B				→			200 OK	IMS_A forwards 200 OK response to IMS_B
37B					→		200 OK	IMS_B forwards the 200 OK response to UE_B
38B						→		User B is informed that call is resumed
39		→						User A ends call
40			→				BYE	UE_A releases the call with BYE
41				→			BYE	IMS_A forwards BYE to IMS_B
42					→		BYE	IMS_B forwards BYE to UE_B
43						→		User B is informed that call has ended
44					←		200 OK	UE_B sends 200 OK for BYE
45				←			200 OK	IMS_B forwards 200 OK response to IMS_A
46			←				200 OK	IMS_A forwards the 200 OK response to UE_A
47		←						User A is informed that call has ended

4.4.3.2.3 UC_04_R: SIP Call Flow "call hold and resume" using UPDATE with CF_ROAM_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
1	→							User A calls User B
2		→			→		INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4						→	INVITE	IMS_A forwards INVITE to IMS_B
5					←		100 Trying	IMS_B responds with a 100 Trying provisional response
6					←		INVITE	IMS_B forwards the INVITE to IMS_A
7						→	100 Trying	IMS_A responds with a 100 Trying provisional response
8				←			INVITE	IMS_A forwards the INVITE to UE_B
9				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
10			←					User B is informed of incoming call of User A
11				→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12						→	180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
15	←							User A is informed that UE_B is ringing

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
16			←					User B answers call
17				→			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
18					→		200 OK	IMS_A forwards 200 OK response to IMS_B
19					←		200 OK	IMS_B forwards the 200 OK response to IMS_A
20		←					200 OK	IMS_A forwards the 200 OK response to UE_A
21	←							User A is informed that call has been answered
22		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
23					→		ACK	IMS_A forwards ACK to IMS_B
24					←		ACK	IMS_B forwards ACK to IMS_A
25				←			ACK	IMS_A forwards ACK to UE_B
26			←					User B is informed that the call is established
27A	→							User A puts call on hold
28A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
29A					→		UPDATE	IMS_A forwards UPDATE to IMS_B
30A					←		UPDATE	IMS_B forwards UPDATE to IMS_A
31A				←			UPDATE	IMS_A forwards UPDATE to UE_B
32A			←					User B is informed that call is on hold
33A				→			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
34A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
35A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
36A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
37A	→							User A resumes call
38A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
39A					→		UPDATE	IMS_A forwards UPDATE to IMS_B
40A					←		UPDATE	IMS_B forwards UPDATE to IMS_A
41A				←			UPDATE	IMS_A forwards UPDATE to UE_B
42A			←					User B is informed that call is resumed
43A				→			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
44A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
45A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
46A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
47A	←							User A is informed that call is resumed
27B			→					User B puts call on hold
28B				→			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
29B					→		UPDATE	IMS_A forwards UPDATE to IMS_B
30B					←		UPDATE	IMS_B forwards UPDATE to IMS_A
31B		←					UPDATE	IMS_A forwards UPDATE to UE_A
32B	←							User A is informed that call on hold
33B		→					200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "recvonly"
34B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
35B					←		200 OK	IMS_B forwards 200 OK response to IMS_A
36B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
37B			→					User B resumes call
38B				→			UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
39B					→		UPDATE	IMS_A forwards UPDATE to IMS_B
40B					←		UPDATE	IMS_B forwards UPDATE to IMS_A

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
41B		←			←		UPDATE	IMS_A forwards UPDATE to UE_A
42B	←							User A is informed that call is resumed
43B		→			→		200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
44B					→	→	200 OK	IMS_A forwards 200 OK response to IMS_B
45B					←	←	200 OK	IMS_B forwards 200 OK to IMS_A
46B				←	←		200 OK	IMS_A forwards the 200 OK response to UE_B
47B			←	←				User B is informed that call is resumed
48	→	→						User A ends call
49		→			→		BYE	UE_A releases the call with BYE
50					→	→	BYE	IMS_A forwards BYE to IMS_B
51					←	←	BYE	IMS_B forwards BYE to IMS_A
52				←	←		BYE	IMS_A forwards BYE to UE_B
53			←	←				User B is informed that call has ended
54				→	→		200 OK	UE_B sends 200 OK for BYE
55					→	→	200 OK	IMS_A forwards 200 OK response to IMS_B
56					←	←	200 OK	IMS_B forwards the 200 OK response to IMS_A
57		←			←		200 OK	IMS_A forwards the 200 OK response to UE_A
58	←	←						User A is informed that call has ended

4.4.4 IMS message exchange between UEs in different networks

4.4.4.1 Description

The UE_A sends a MESSAGE to UE_B located in a different network.

The test sequence typically associated with this use case when an established session is released is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_INT_CALL	CF_ROAM_CALL
1	User A sends an instant message	Step 1	Step 1
2	User B is informed about the instant message	Step 5	Step 6
3	Optional: User A is presented a delivery report	Step 9	Step 11

4.4.4.2 UC_05_I: SIP Call flow for IMS Message Exchange with CF_INT_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A sends an instant message to user B
2		→					MESSAGE	UE_A sends MESSAGE to IMS_A
3			→				MESSAGE	IMS_A sends MESSAGE to IMS_B
4				→			MESSAGE	IMS_B sends MESSAGE to UE_B
5					→			User B is informed about the instant message
6				←			200 OK	UE_B sends 200 OK to IMS_B
7			←				200 OK	IMS_B sends 200 OK to IMS_A
8		←					200 OK	IMS_A sends 200 OK to UE_A
9	←							Optional: User A is presented a delivery report

4.4.4.3 UC_05_R: SIP Call Flow for IMS Message Exchange with CF_ROAM_CALL

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
1	→							User A sends an instant message to user B
2		→			→		MESSAGE	UE_A sends MESSAGE to IMS_A
3						→	MESSAGE	IMS_A forwards MESSAGE to IMS_B
4					←		MESSAGE	IMS_B forwards MESSAGE to IMSA
5				←			MESSAGE	IMS_A forwards MESSAGE to UE_B
6			←					User B is informed about the instant message
7				→			200 OK	UE_B responds with 200 OK to IMS_A
8						→	200 OK	IMS_A forwards 200 OK to IMS_B
9					←		200 OK	IMS_B forwards 200 OK to IMS_A
10		←					200 OK	IMS_A forwards 200 OK to UE_A
11	←							Optional: User A is presented a delivery report

4.4.5 Supplementary Service Anonymous Communication Rejection (ACR)

4.4.5.1 Description

UE_A makes an IMS VoIP call to UE_B while UE_B is roaming in IMS A. UE_A is subscribed to OIR service in permanent mode or default presentation restricted temporary mode, UE_B is subscribed to ACR supplementary service. The call flow path and node configuration for this use case corresponds to CF_ROAM_AS.

The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User A calls User B	Step 1
2	User A is informed that call has been rejected due to ACR	Step 17

4.4.5.2 UC_06_R: SIP message flow for SS ACR with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1	→									User A calls User B
2		→	→	→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
										INVITE triggers the OIR IFC in IMS_A
4					→				INVITE	IMS_A forwards the INVITE to IMS_A AS
5					←				100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
6					←				INVITE	IMS_A AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_A
7					→				100 Trying	IMS_A responds with a 100 Trying provisional response
8						→			INVITE	IMS_A forwards INVITE to IMS_B
9						←			100 Trying	IMS_B responds with a 100 Trying provisional response
										INVITE triggers the ACR IFC in IMS_B
10							→		INVITE	IMS_B forwards the INVITE to IMS_B AS
11							←		100 Trying	AS optionally responds with a 100 Trying provisional response
12							←		433 Anonymity Disallowed	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
13						←			433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_A
14					→				433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS
15					←				433 Anonymity Disallowed	IMS_A AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_A
16		←							433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to UE_A
17	←									User A is informed that the call has been rejected due to ACR
18		→	→	→					ACK	UE_A sends ACK to IMS_A
19					→				ACK	IMS_A forwards the ACK to IMS_A AS
20					←				ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
21						→			ACK	IMS_A forwards ACK to IMS_B
22							→		ACK	IMS_B forwards ACK to IMS_B AS

4.4.6 Supplementary Service Outgoing Communication Barring (OCB)

4.4.6.1 Description

While roaming in IMS A network, UE_B places an IMS VoIP call to UE_A. UE_B is subscribed to OCB service and based on the UE_B identity the OCB service is invoked. The call flow path and node configuration for this use case corresponds to CF_ ROAM_AS.

The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User B calls User A	Step 1
2	User B is informed that call was declined	Step 11

4.4.6.2 UC_07_R: SIP message flow for SS OCB with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
1				→					User B calls User A
2					→			INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3					←			100 Trying	IMS_A responds with a 100 Trying provisional response
4						→		INVITE	IMS_A forwards INVITE to IMS_B
5						←		100 Trying	IMS_B responds with a 100 Trying provisional response
									INVITE triggers the OCB IFC in IMS_B
6							→	INVITE	IMS_B forwards the INVITE to IMS_B AS
7							←	100 Trying	AS optionally responds with a 100 Trying provisional response
8							←	603 Decline	IMS_B AS returns 603 Decline to IMS_B
9						←		603 Decline	IMS_B forwards the 603 Decline to IMS_A
10		←			←			603 Decline	IMS_A forwards the 603 Decline to UE_B
11		←							User B is informed that call was declined
12			→		→			ACK	UE_B sends ACK to IMS_A
13						→		ACK	IMS_A forwards ACK to IMS_B
14							→	ACK	IMS_B forwards ACK to IMS_B AS

4.4.7 Supplementary Service Originating Identification Presentation (OIP)

4.4.7.1 Description

UE_A places an IMS VoIP call to UE_B while UE_B is roaming in IMS A network. UE_B is subscribed to OIP service. The call flow path and node configuration for this use case corresponds to CF_ROAM_AS.

The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User A calls User B	Step 1
2	User B is informed of incoming call of User A, user A's identity is displayed	Step 14
3	User A is informed that UE_B is ringing	Step 21
4	User B answers call	Step 22
5	User A is informed that call has been answered	Step 29
6	User B is informed that the call is established	Step 36
7	User A ends call	Step 37
8	User B is informed that call has ended	Step 44
9	User A is informed that call has ended	Step 51

4.4.7.2 UC_08_R: SIP message flow for SS OIP with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / IMS B / AS B		
1	User A → UE A		User A calls User B
2	UE A → IMS A	INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3	IMS A → UE A	100 Trying	IMS_A responds with a 100 Trying provisional response
4	IMS A → IMS B	INVITE	IMS_A forwards INVITE to IMS_B
5	IMS B → IMS A	100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_B
6	IMS B → AS B	INVITE	IMS_B forwards the INVITE to IMS_B AS
7	AS B → IMS B	100 Trying	AS optionally responds with a 100 Trying provisional response
8	AS B → IMS B	INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
9	IMS B → AS B	100 Trying	IMS_B responds with a 100 Trying provisional response
10	IMS B → IMS A	INVITE	IMS_B forwards the INVITE to IMS_A
11	IMS A → IMS B	100 Trying	IMS_A responds with a 100 Trying provisional response
12	IMS A → UE B	INVITE	IMS_A forwards the INVITE to UE_B
13	UE B → IMS A	100 Trying	UE_B optionally responds with a 100 Trying provisional response
14	UE B → User B		User B is informed of incoming call of User A, User A's identity is displayed
15	UE B → IMS A	180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16	IMS A → IMS B	180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
17	IMS B → AS B	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
18	AS B → IMS B	180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
19	IMS B → IMS A	180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
20	IMS A → UE A	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
21	UE A → User A		User A is informed that UE_B is ringing
22	User B → UE B		User B answers call
23	UE B → IMS A	200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
24	IMS A → IMS B	200 OK	IMS_A forwards 200 OK response to IMS_B
25	IMS B → AS B	200 OK	IMS_B forwards 200 OK response to IMS_B AS
26	AS B → IMS B	200 OK	IMS_B AS forwards 200 OK response to IMS_B
27	IMS B → IMS A	200 OK	IMS_B forwards the 200 OK response to IMS_A
28	IMS A → UE A	200 OK	IMS_A forwards the 200 OK response to UE_A
29	UE A → User A		User A is informed that call has been answered
30	UE A → IMS A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
31	IMS A → IMS B	ACK	IMS_A forwards ACK to IMS_B
32	IMS B → AS B	ACK	IMS_B forwards ACK to IMS_B AS

Step	Direction							Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB	ASB		
33						←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
34					←			ACK	IMS_B forwards ACK to IMS_A
35				←				ACK	IMS_A forwards ACK to UE_B
36			←						User B is informed that the call is established
37		→							User A ends call
38			→		→			BYE	UE_A releases the call with BYE
39					→			BYE	IMS_A forwards BYE to IMS_B
40						→		BYE	IMS_B forwards BYE to IMS_B AS
41						←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
42					←			BYE	IMS_B forwards BYE to IMS_A
43				←				BYE	IMS_A forwards BYE to UE_B
44			←						User B is informed that call has ended
45				→	→			200 OK	UE_B sends 200 OK for BYE
46					→			200 OK	IMS_A forwards 200 OK response to IMS_B
47						→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
48						←		200 OK	IMS_B AS forwards 200 OK response to IMS_B
49					←			200 OK	IMS_B forwards the 200 OK response to IMS_A
50		←			←			200 OK	IMS_A forwards the 200 OK response to UE_A
51		←							User A is informed that call has ended

4.4.8 Supplementary Service Originating Identification Restriction (OIR)

4.4.8.1 Description

While roaming in IMS A network, UE_B places an IMS VoIP call to UE_A. UE_A is subscribed to OIP service, UE_B is subscribed to OIR service in permanent mode or default presentation restricted temporary mode. The call flow path and node configuration for this use case corresponds to CF_ROAM_AS.

The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User B calls User A	Step 1
2	User A is informed of incoming call of User B, user B's identity is not displayed	Step 18
3	User B is informed that UE_A is ringing	Step 27
4	User A answers call	Step 28
5	User B is informed that call has been answered	Step 37
6	User A is informed that the call is established	Step 46
7	User A ends call	Step 47
8	User B is informed that call has ended	Step 56
9	User A is informed that call has ended	Step 65

4.4.8.2 UC_09_R: SIP message flow for SS OIR with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction	Message	Comment
1			User B calls User A
2		INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		INVITE	IMS_A forwards INVITE to IMS_B
5		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the OIR IFC in IMS_B
6		INVITE	IMS_B forwards the INVITE to IMS_B AS
7		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
8		INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
9		100 Trying	IMS_B responds with a 100 Trying provisional response
10		INVITE	IMS_B forwards the INVITE to IMS_A
11		100 Trying	IMS_A responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_A
12		INVITE	IMS_A forwards the INVITE to IMS_A AS
13		100 Trying	IMS A AS optionally responds with a 100 Trying provisional response
14		INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
15		100 Trying	IMS_A responds with a 100 Trying provisional response
16		INVITE	IMS_A forwards the INVITE to UE_A
17		100 Trying	UE_A optionally responds with a 100 Trying provisional response
18			User A is informed of incoming call of User B, user B's identity is not displayed
19		180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20		180 Ringing	IMS_A forwards the 180 Ringing to IMS_A AS
21		180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
22		180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
23		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
24		180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
25		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
26		180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
27			User B is informed that UE_A is ringing
28			User A answers call

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
29		→				→			200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
30						→			200 OK	IMS_A forwards the 200 OK to IMS_A AS
31						←			200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
32							→		200 OK	IMS_A forwards 200 OK response to IMS_B
33								→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
34							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
351						←			200 OK	IMS_B forwards the 200 OK response to IMS_A
36					←				200 OK	IMS_A forwards the 200 OK response to UE_B
37			←							User B is informed that call has been answered
38						→			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
39							→		ACK	IMS_A forwards ACK to IMS_B
40								→	ACK	IMS_B forwards ACK to IMS_B AS
41							←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
42						←			ACK	IMS_B forwards ACK to IMS_A
43						→			ACK	IMS_A forwards the ACK to IMS_A AS
44						←			ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
45		←							ACK	IMS_A forwards ACK to UE_A
46	←									User A is informed that the call is established
47	→									User A ends call
48		→				→			BYE	UE_A releases the call with BYE
49							→		BYE	IMS_A forwards BYE to IMS_B
50								→	BYE	IMS_B forwards BYE to IMS_B AS
51							←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
52						←			BYE	IMS_B forwards BYE to IMS_A
53						→			BYE	IMS_A forwards the BYE to IMS_A AS
54						←			BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
55					←				BYE	IMS_A forwards BYE to UE_B
56			←							User B is informed that call has ended
57						→			200 OK	UE_B sends 200 OK for BYE
58							→		200 OK	IMS_A forwards 200 OK response to IMS_B
59								→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
60							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
61						←			200 OK	IMS_B forwards the 200 OK response to IMS_A
62						→			200 OK	IMS_A forwards the 200 OK to IMS_A AS
63						←			200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
64		←							200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
65	←									User A is informed that call has ended

4.4.9 Supplementary Service HOLD

4.4.9.1 Description

UE_A places an IMS VoIP call to UE_B which places the call on HOLD. UE_A will be notified by the AS that the call is on hold. UE_B will resume the call, and UE_A will be informed by the AS that the call is resumed.

The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User A calls User B	1
2	User B is informed of incoming call of User A	10
3	User A is informed that UE_B is ringing	15
4	User B answers call	16
5	User A is informed that call has been answered	21
6	User B is informed that call is established	26
7	User B puts call on hold	27
8	User A is informed that call on hold with AS tone	40
9	User B is informed that call on hold	47
10	User B resumes call	54
11	User A is informed that call is resumed	67
12	User B is informed that call is resumed	81
13	User A ends call	82
14	User B is informed that call has ended	86
15	User A is informed that call has ended	91

4.4.9.1.1 UC_10_R: SIP Call Flow "call hold and resume with AS tone" using reINVITE with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
1	→								User A calls User B
2		→			→			INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←			100 Trying	IMS_A responds with a 100 Trying provisional response
4					→	→		INVITE	IMS_A forwards INVITE to IMS_B
5					←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
6					←	←		INVITE	IMS_B forwards INVITE to IMS_A
7					→	→		100 Trying	IMS_A responds with a 100 Trying provisional response
8				←	←			INVITE	IMS_A forwards INVITE to UE_B

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
9				←				100 Trying	UE_B optionally responds with a 100 Trying provisional response
10			←						User B is informed of incoming call of User A
11				←				180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12					→			180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←			180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14		←						180 Ringing	IMS_A P- forwards the 180 Ringing response to UE_A
15	←								User A is informed that UE_B is ringing
16			→						User B answers call
17				→				200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
18					→			200 OK	IMS_A forwards 200 OK response to IMS_B
19					←			200 OK	IMS_B forwards 200 OK response to IMS_A
20		←						200 OK	IMS_A forwards the 200 OK response to UE_A
21	←								User A is informed that call has been answered
22					→			ACK	UE_A acknowledges the receipt of 200 OK for INVITE
23						→		ACK	IMS_A forwards ACK to IMS_B
24						←		ACK	IMS_B forwards ACK to IMS_A
25				←				ACK	IMS_A forwards ACK to UE_B
26			←						User B is informed that call is established
27			→						User B puts call on hold
28				→				INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
29				←				100 Trying	IMS_A responds with a 100 Trying provisional response
30					→			INVITE	IMS_A forwards INVITE to IMS_B
31					←			100 Trying	IMS_B responds with a 100 Trying provisional response
32						→		INVITE	IMS_B sends reINVITE to AS_B
33						←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
35						←		INVITE	AS_B sends reINVITE to IMS_B
35						→		100 Trying	IMS_B responds with a 100 Trying provisional response
36					←			INVITE	IMS_B forwards reINVITE to IMS_A
37					→			100 Trying	IMS_A responds with a 100 Trying provisional response
38		←						INVITE	IMS_A forwards reINVITE to UE_A

Step	Direction							Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB	ASB		
39								100 Trying	UE_A optionally responds with a 100 Trying provisional response
40									User A is informed that call is on hold with AS tone
41								200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
42								200 OK	IMS_A forwards 200 OK response to IMS_B
43								200 OK	IMS_B forwards 200 OK response to AS_B
44								200 OK	AS_B forwards 200 OK response to IMS_B
45								200 OK	IMS_B forwards 200 OK response to IMS_A
46								200 OK	IMS_A forward the 200 OK to UE_B
47									User B is informed that the call is on hold
48								ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
49								ACK	IMS_A forwards ACK to IMS_B
50								ACK	IMS_B forwards ACK to AS_B
51								ACK	AS_B forwards ACK to IMS_B
52								ACK	IMS_B forwards ACK to IMS_A
53								ACK	IMS_A forwards ACK to UE_A
54									User B resumes call
55								INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
56								100 Trying	IMS_A responds with a 100 Trying provisional response
57								INVITE	IMS_A sends reINVITE to IMS_B
58								100 Trying	IMS_B responds with a 100 Trying provisional response
59								INVITE	IMS_B sends reINVITE to AS_B
60								100 Trying	AS_B optionally responds with a 100 Trying provisional response
61								INVITE	AS_B forwards INVITE to IMS_B
62								100 Trying	IMS_B responds with a 100 Trying provisional response
63								INVITE	IMS_B sends reINVITE to IMS_A
64								100 Trying	IMS_A responds with a 100 Trying provisional response
65								INVITE	IMS_A forwards reINVITE to UE_A
66								100 Trying	UE_A optionally responds with a 100 Trying provisional response
67									User A is informed that call is resumed
68								200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
69								200 OK	IMS_A forwards 200 OK response to IMS_B

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
70								200 OK	IMS_B forwards 200 OK response to AS_B
71								200 OK	AS_B forwards the 200 OK for INVITE
72								200 OK	IMS_B forwards 200 OK to IMS_A
73								200 OK	IMS_A forwards 200 OK to UE_B
74									User B is informed that call is resumed
75								ACK	UE_B sends ACK to IMS_A
76								ACK	IMS_A forwards ACK to IMS_B
77								ACK	IMS_B forwards ACK to AS_B
78								ACK	AS_B forwards ACK to IMS_B
79								ACK	IMS_B forwards ACK to IMS_A
80								ACK	IMS_A forwards ACK to UE_A
81								ACK	User A is informed that call resumed
82									User A ends call
83								BYE	UE_A releases the call with BYE
84								BYE	IMS_A forwards BYE to IMS_B
85								BYE	IMS_B forwards BYE to UE_B
86									User B is informed that call has ended
87								200 OK	UE_B sends 200 OK for BYE
88								200 OK	IMS_A forwards 200 OK response to IMS_B
89								200 OK	IMS_B forwards 200 OK response to IMS_A
90								200 OK	IMS_A forwards the 200 OK response to UE_A
91									User A is informed that call has ended

4.4.10 Supplementary Service Call Forward Unconditional (CFU)

4.4.10.1 Description

UE_A places an IMS VoIP call to UE_B which has CFU activated towards user UE_B2 which is located in IMS_A. UE_A may be notified by the AS that the call is forwarded. UE_B2 answers the call without previous ringing indication. The call is released by UE_A.

The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

Step	Action	CF_ROAM_AS
1	User A calls User B	1
2	User A may be informed of call diversion	11
3	User B2 answers call	19
4	User A is informed that call has been answered	26
6	User B2 is informed that call is established	32
7	User A ends call	33
8	User B2 is informed that call has ended	37
9	User A is informed that call has ended	42

4.4.10.1.1 UC_11_R: SIP Call Flow "Communication Forwarding unconditional" with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction	Message	Comment
	User A / UE A / User B2 / UE B2 / IMS A / IMS B / AS B		
1	→ UE A		User A calls User B
2	UE A → IMS A	INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3	IMS A → UE A	100 Trying	IMS_A responds with a 100 Trying provisional response
4	IMS A → IMS B	INVITE	IMS_A forwards INVITE to IMS_B
5	IMS B → IMS A	100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the CFU IFC in IMS_B
6	IMS B → AS B	INVITE	IMS_B forwards the INVITE to AS_B
7	AS B → IMS B	100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
			AS_B applies the CDIV CFU procedure
8	AS B → IMS B	181 Call is being forwarded	AS_B indicates optionally to IMS_B that call has been forwarded
9	IMS B → IMS A	181 Call is being forwarded	IMS_B indicates to IMS_A that call has been forwarded
10	IMS A → UE A	181 Call is being forwarded	IMS_A indicates that call to UE_B has been forwarded
11	UE A → User A		User A may be informed of call diversion
12	IMS B → AS B	INVITE	AS_B returns modified INVITE including new request URI and history header to IMS_B
13	AS B → IMS B	100 Trying	IMS_B responds with a 100 Trying provisional response
14	IMS B → IMS A	INVITE	IMS_B forwards the INVITE to IMS_A
15	IMS A → IMS B	100 Trying	IMS_A responds with a 100 Trying provisional response
16	IMS A → UE B2	INVITE	IMS_A forwards the INVITE to UE_B2
17	UE B2 → IMS A	100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
18	User B2 → UE B2		User B2 is informed of incoming call of User A
19	→ User B2		User B2 answers call

Step	Direction							Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IMS B	AS B		
20				→				200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
21					→			200 OK	IMS_A forwards 200 OK response to IMS_B
22						→		200 OK	IMS_B forwards 200 OK response to AS_B
23						←		200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
24					←			200 OK	IMS_B forwards 200 OK response to IMS_A
25		←						200 OK	IMS_A forwards 200 OK response to UE_A
26	←								User A is informed that call has been answered
27		→		→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
28					→			ACK	IMS_A forwards ACK to IMS_B
29						→		ACK	IMS_B forwards ACK to AS_B
30						←		ACK	AS_B returns, possibly modified, ACK to IMS_B
31			←					ACK	IMS_B forwards ACK to UE_B2
32			←						User B2 is informed that call is established
33	→								User A ends call
34		→			→			BYE	UE_A releases the call with BYE
35						→		BYE	IMS_A forwards BYE to IMS_B
36				←				BYE	IMS_B forwards BYE to UE_B
37			←						User B is informed that call has ended
38				→				200 OK	UE_B sends 200 OK for BYE
39					→			200 OK	IMS_A forwards 200 OK response to IMS_B
40					←			200 OK	IMS_B forwards 200 OK response to IMS_A
41		←						200 OK	IMS_A forwards the 200 OK response to UE_A
42	←								User A is informed that call has ended

4.4.10.1.2 UC_12: SIP Call Flow "Normal Call" with 2 UEs registered to same public identity

The test sequence and expected call flow sequence when user A calls user B with 2 UEs, i.e. UE_B1 and UEB2, in an interworking scenario is:

Step	Action	CF_INT_CALL
1	User A calls User B	Step 1
2	User B is informed of incoming call of User A on UE_B1	Step 8
3	User B is informed of incoming call of User A on UE_B2	Step 8
4	User A is informed that a UE of User B is ringing	Step 12
5	User B answers call on UE_B2	Step 13
6	User B is informed at UE_B1 that the call is no longer offered	Step 21
7	User A is informed that call has been answered	Step 17
8	User B is informed that the call is established	Step 21
9A	User A ends call	Step 22A
9B	User B ends call	Step 22B
10A	User B is informed that call has ended	Step 26A
10B	User A is informed that call has ended	Step 26B
11A	User A is informed that call has ended	Step 30A
11B	User B is informed that call has ended	Step 30B

Note that steps 6 and 7 may happen in different order.

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A calls User B
2		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6				→			INVITE	IMS_B forwards INVITE to UE_B1
7				←			100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
8					→			User B is informed on UE_B1 of incoming call of User A
9				←			180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that a UE of User B is ringing
13				→			INVITE	IMS_B forwards INVITE to UE_B2
14				←			100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
15					→			User B is informed on UE_B2 of incoming call of User A
16				←			180 Ringing	UE_B2 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
17			←				180 Ringing	IMS_B forwards 2nd 180 Ringing response to IMS_A
18		←					180 Ringing	IMS_A forwards the 2nd 180 Ringing response to UE_A
19					←			User B answers call at UE_B2
20				←			200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
21				←			CANCEL	IMS_B sends CANCEL request to UE_B1
22				→			200 OK	UE_B1 sends 200 OK response to the CANCEL request to IMS_B
23						←		UE_B1 informs user B that the call is no longer offered to this UE and stops ringing
24			←				200 OK	IMS_B forwards 200 OK response to IMS_A
25		←					200 OK	IMS_A forwards the 200 OK response to UE_A
26	←							User A is informed that call has been answered
27		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
28			→				ACK	IMS_A forwards ACK to IMS_B
29				→			ACK	IMS_B forwards ACK to UE_B
30					←			User B is informed that the call is established
31A	→							User A ends call
32A		→					BYE	UE_A releases the call with BYE
33A			→				BYE	IMS_A forwards BYE to IMS_B
34A				→			BYE	IMS_B forwards BYE to UE_B
35A					←			User B is informed that call has ended
36A				←			200 OK	UE_B sends 200 OK for BYE
37A			←				200 OK	IMS_B forwards 200 OK response to IMS_A
38A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
39A	←							User A is informed that call has ended
31B					→			User B ends call
32B				←			BYE	UE_B releases the call with BYE
33B			←				BYE	IMS_B forwards BYE to IMS_A
34B		←					BYE	IMS_A forwards BYE to UE_A
35B	←							User A is informed that call has ended
36B		→					200 OK	UE_A sends 200 OK for BYE
37B			→				200 OK	IMS_A forwards 200 OK response to IMS_B
38B				→			200 OK	IMS_B forwards the 200 OK response to UE_B
39B					→			User B is informed that call has ended

Note that the call flow sequence steps 6 through 12 and 13 through 18 may occur in an interleaved fashion. In addition, steps 21 through 23 and steps 24 through 26 may also occur in an interleaved fashion.

4.5 Test Descriptions

This clause introduces interoperability test descriptions (TDs) which realize one or more IMS NNI test purposes of TS 186 011-1 [2].

Each TD is defined on the basis of one of the generic use cases forms presented in the previous clause. Each test sequence step in a TD includes also a reference to a specific call flow step of the generic use case. Call flow steps which are associated with the test body are repeated after each TD and include any modifications necessary to adapt the generic use case. In the adapted call flow steps that are associated with user interactions are shown shaded and steps which have pass criteria are associated with are shown in bold.

Note that the expected test sequence may only show the Call Flow that affects the test.

In the tabulations which follow, all references are to ES 283 003 [1].

4.5.1 General Capabilities

4.5.1.1 SIP messages longer than 1 500 bytes

Interoperability Test Description		
Identifier:	TD_IMS_0001	
Summary:	IMS network shall support SIP messages greater than 1 500 bytes	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_4002_1	ES 283 003 [1], clause 4.2A ¶1
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A and IMS_A configured to use TCP for transport • UE_A is registered in IMS_A using any user identity • UE_B is registered user of IMS_B using any user identity	
Test Sequence:	**Step**	
	1	User A sends message to User B with at least 1 500 characters
	2	Verify that user B receives message from user A
Conformance Criteria:	**Check**	
	1	TP_IMS_4002_01 in CFW step 3 (MESSAGE) *ensure that {* *when { UE_A sends a MESSAGE to UE_B* *containing a Message_Body greater than 1 300 bytes }* *then { IMS_B receives the MESSAGE* *containing the Message_Body greater than 1 300 bytes }* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A sends an instant message to user B
2		→					MESSAGE	UE_A sends MESSAGE to IMS_A
3			→				**MESSAGE**	**IMS_A sends MESSAGE to IMS_B with via header indicating TCP**
4				→			MESSAGE	IMS_B sends MESSAGE to UE_B
5					→			User B is informed about the instant message
6				←			200 OK	UE_B sends 200 OK to IMS_B
7			←				200 OK	IMS_B sends 200 OK to IMS_A
8		←					200 OK	IMS_A sends 200 OK to UE_A
9	←							Optional: User A is presented a delivery report

4.5.2 Registration and De-registration

4.5.2.1 First time registration in a visited IMS network

Interoperability Test Description		
Identifier:	TD_IMS_0002	
Summary:	First time registration in a visited IMS network	
Configuration:	CF_ROAM_REG	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5011_01	ES 283 003 [1], clause 5.2.2 ¶2
	TP_IMS_5011_02	ES 283 003 [1], clause 5.2.2 ¶2
	TP_IMS_5044_01	ES 283 003 [1], clause 5.2.3 ¶1
	TP_IMS_5089_01	ES 283 003 [1], clause 5.4.1.2.1 ¶6
	TP_IMS_5092_01	ES 283 003 [1], clause 5.4.1.2.2 ¶1
	TP_IMS_5096_01	ES 283 003 [1], clause 5.4.2.1.1 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B not registered in IMS_B • IMS_A within the trust domain of IMS_B • UE_B is configured to use AKA authentication	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any valid user identity
	2	Verify that UE_B shows successful registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5011_01 in CFW step 3 (REGISTER): *ensure that {* *when { UE_B sends an unprotected REGISTER to IMS_A* *containing a Security-Client_header }* *then { IMS_A sends the REGISTER to IMS_B* *containing a Path_header* *containing P-CSCF_SIP_URI of IMS_A and* *containing a Require_header* *containing a path_option_tag and* *containing a P-Charging-Vector_header* *containing an icid_parameter and* *containing a Authorization_header* *containing an integrity-protected_parameter* *indicating no* *not containing a Security-Verify_header and* *not containing a Security-Client_header and* *containing a P-Visited-Network-ID_header* *indicating "the visited network at the home network" }* *}*

Interoperability Test Description		
	2	TP_IMS_5011_02 in CFW step 7 (REGISTER): *ensure that {* *when { UE_B sends a protected REGISTER to IMS_A* *containing a Security-Client_header }* *then { IMS_A sends the REGISTER to IMS_B* *containing a Path_header* *containing P-CSCF_SIP_URI of IMS_A and* *containing a Require_header* *containing a path_option_tag and* *containing a P-Charging-Vector_header* *containing an icid_parameter and* *containing a Authorization_header* *containing an integrity-protected_parameter* *indicating yes* *not containing a Security-Verify _header and* *not containing a Security-Client_header and* *containing a P-Visited-Network-ID_header* *indicating "the visited network at the home network" }* *}*
	3	TP_IMS_5044_01 in CFW step 10 (SUBSCRIBE): *ensure that {* *when { IMS_A receives a 200_response from IMS_B* *}* *then { IMS_A sends a SUBSCRIBE to IMS_B* *containing a Request_URI* *indicating "the resource to which the P-CSCF wants* *to subscribe to" and* *containing a From_header* *indicating P-CSCF_SIP_URI of IMS_A and* *containing a To_header* *indicating the default_public_user_identity of UE_B and* *containing an Event_header* *indicating the reg_event_package and* *containing an Expires_header* *set to "a value greater than the one in the Expires_header* *of the 200_response" and* *containing a P-Asserted-Identity_header* *set to the P-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	4	TP_IMS_5089_01 in CFW step 4 (401 Unauthorized): *ensure that {* *when { UE_B sends an initial REGISTER to IMS_B and* *IMS_A sends the REGISTER to IMS_B* *containing an Authorization_header* *(not containing an integrity-protected_parameter or* *containing an integrity-protected_parameter indicating no) }* *then { IMS_B sends a 401_response to IMS_A* *containing an WWW-Authenticate_header* *containing a realm_parameter* *indicating the operator_identifier of IMS_B and* *containing a nonce_parameter* *(containing a RAND_parameter and* *containing an AUTN_parameter) and* *containing an algorithm_parameter* *indicating AKAv1-MD5 and* *containing an ik_parameter and* *containing a ck_parameter }* *}*

Interoperability Test Description		
	5	TP_IMS_5092_01 in CFW step 8 (200 Ok): *ensure that {* *when { UE_B sends a protected REGISTER to IMS_B and* *IMS_A sends the REGISTER to IMS_B* *containing an Authorization_header* *containing an integrity-protected_parameter indicating yes }* *then { IMS_B sends 200_response to IMS_A* *containing the same Path_header as in the protected REGISTER* *and* *containing a P-Associated-URI_header* *containing all registered_public_identities and "its* *associated set of implicitly registered public user identities"* *indicating (first the default_public_user_identity and* *no barred_public_user_identities) and* *containing a Service-Route_header* *indicating the S-CSCF_SIP_URI of IMS_B and* *containing a Contact_header* *indicating "all contact addresses"* *for the default_public_user_identity of UE_B }* *}*
	6	TP_IMS_5096_01 in CFW step 16 (200 Ok): *ensure that {* *when {* *IMS_B receives a SUBSCRIBE from UE_B via IMS_A* *containing an Event_header indicating the reg_event_package }* *then {* *IMS_B sends a 2XX_response to UE_B* *containing an Expires_header* *indicating "the same or lower expiry time than* *specified in the initial SUBSCRIBE" }* *}*

Step	Direction						Message	Comment
			User B	**UE B**	**IMS A**	**IMS B**		
1			→					User B registers in IMS B
2				→			REGISTER	UE_B sends a REGISTER to IMS_A
3					→		**REGISTER**	**IMS_A forwards the REGISTER to IMS_B**
4					←		**401 Unauthorized**	**IMS_B responds with 401 Unauthorized to IMS_A**
5				←			401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
6				→			REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
7					→		**REGISTER**	**IMS_A forwards the REGISTER to IMS B**
8					←		**200 OK**	**IMS_B responds with 200 OK**
9				←			200 OK	IMS_A forwards the 200 OK response to UE_B
10					→		**SUBSCRIBE**	**IMS_A sends a SUBSCRIBE to IMS_B**
11					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
12					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
13					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
14				→			SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
15					→		SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IMS_B
16					←		**200 OK** or 202 Accepted	**IMS_B responds with 200 OK** or 202 Accepted
17				←			200 OK or 202 Accepted	IMS_A forwards the 200 OK response to UE_B or 202 Accepted

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
18					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
19				←			NOTIFY	IMS_A forwards the NOTIFY to UE_B
20				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
21					→		200 OK	IMS_A forwards the 200 OK to IMS_B
22			←					User B is informed about successful registration

4.5.2.2 No response from first entry point on REGISTER without topology hiding

Interoperability Test Description		
Identifier:	TD_IMS_0003	
Summary:	IMS network chooses a second entry point to the home network of a user that requested registration, if the first entry point does not answer, without topology hiding.	
Configuration:	CF_ROAM_REG	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5203_01	ES 283 003 [1], clause 5.2.2 ¶26
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • IMS_A configured with multiple entry points for IMS_B • IMS_A not configured for topology hiding • First entry point determined by the IMS_A pointing to a non-existing component in IMS_B	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows successful registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5203_01 in CFW step 4 (REGISTER): [I-CSCF] *ensure that {* *when { IMS_A receives no response from IMS_B }* *then { IMS_A sends the REGISTER to another_entry_point of IMS_B }* *}*

	2	TP_IMS_5092_01 in CFW step 9 (200 Ok):
		ensure that {
		when { UE_B sends a protected REGISTER to IMS_B and
		IMS_A sends the REGISTER to IMS_B
		containing an Authorization_header
		containing an integrity-protected_parameter indicating yes }
		then { IMS_B sends 200_response to IMS_A
		containing the same Path_header as in the protected REGISTER
		and
		containing a P-Associated-URI_header
		containing all registered_public_identities and "its
		associated set of implicitly registered public user identities"
		indicating (first the default_public_user_identity and
		no barred_public_user_identities) and
		containing a Service-Route_header
		indicating the S-CSCF_SIP_URI of IMS_B and
		containing a Contact_header
		indicating "all contact addresses"
		for the default_public_user_identity of UE_B }
		}

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
1			→					User B activates the UE in the home network
2				→			REGISTER	UE_B sends a REGISTER to IMS_A
3					→		REGISTER	IMS_A forwards the REGISTER to first entry point defined for IMS_B
								No response from IMS_B
4					→		**REGISTER**	**IMS_A sends a REGISTER to another entry point defined for IMS_B**
5					←		401 Unauthorized	IMS_B responds with 401 Unauthorized to IMS_A
6				←			401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
7				→			REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
8					→		**REGISTER**	**IMS_A forwards the REGISTER to IMS B**
9					←		200 OK	IMS_B responds with 200 OK
10				←			200 OK	IMS_A forwards the 200 OK response to UE_B
11					→		SUBSCRIBE	IMS_A sends a SUBSCRIBE to IMS_B
12					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
13					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
14					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
15				→			SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
16					→		SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IMS_B
17					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
18				←			200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
19					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
20				←			NOTIFY	IMS_A forwards the NOTIFY to UE_B
21				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
22					→		200 OK	IMS_A forwards the 200 OK to IMS_B
23			←					User B is informed about successful registration

4.5.2.3 No response from first entry point on REGISTER with topology hiding

Interoperability Test Description		
Identifier:	TD_IMS_0003H	
Summary:	IMS network chooses a second entry point to the home network of a user that requested registration, if the first entry point does not answer. With topology hiding	
Configuration:	CF_ROAM_REG	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5402_01	ES 283 003 [1], clause 5.10.2.1 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • IMS_A configured with multiple entry points for IMS_B • IMS_A configured for topology hiding • First entry point determined by the IMS_A pointing to a non-existing component in IMS_B	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows successful registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5402_01 in CFW step 4 (REGISTER): [IBCF] *ensure that {* *when { UE_B sends a REGISTER to IMS_A and IMS_B does not send a response to IMS_A }* *then { IMS_A sends the original REGISTER to another_entry_point of IMS_B }* *}*

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
1			→					User B activates the UE in the home network
2				→			REGISTER	UE_B sends a REGISTER to IMS_A
3					→		REGISTER	IMS_A forwards the REGISTER to first entry point defined for IMS_B
								No response from IMS_B
4					→		**REGISTER**	**IMS_A sends a REGISTER to another entry point defined for IMS_B**
5					←		401 Unauthorized	IMS_B responds with 401 Unauthorized to IMS_A
6				←			401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
7				→			REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
8					→		REGISTER	IMS_A forwards the REGISTER to IMS B
9					←		200 OK	IMS_B responds with 200 OK
10				←			200 OK	IMS_A forwards the 200 OK response to UE_B
11					→		SUBSCRIBE	IMS_A sends a SUBSCRIBE to IMS_B
12					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
13					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
14					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
15				→			SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
16					→		SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IMS_B
17					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
18				←			200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
19					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
20				←			NOTIFY	IMS_A forwards the NOTIFY to UE_B
21				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
22					→		200 OK	IMS_A forwards the 200 OK to IMS_B
23			←					User B is informed about successful registration

4.5.2.4 403 response to REGISTER from an un-trusted domain without topology hiding

Interoperability Test Description		
Identifier:	TD_IMS_0004	
Summary:	IMS network sends 403 response when attempting registration from a different trust domain without topology hiding	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5129_01	ES 283 003 [1], clause 5.3.1.2 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • IMS_B not configured for topology hiding • IMS_A and IMS_B are in different trust domains	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows unsuccessful registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5129_01 in CFW step 3 (REGISTER) [I-CSCF]: *ensure that {* *when { UE_B sends a valid initial REGISTER to IMS_B and IMS_B receives the REGISTER }* *then { IMS_B sends a 403_response to IMS_A }* *}*

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
1			→					User B activates the UE in a visited network
2				→			REGISTER	UE_B sends a REGISTER to IMS_A
3					→		**REGISTER**	**IMS_A forwards the REGISTER to IMS_B**
4					←		**403 Forbidden**	**IMS_B responds with 403 Forbidden to IMS_A**
5				←			403 Forbidden	IMS_A forwards the 403 Forbidden to UE_B
6			←					User B is informed about the registration is rejected

4.5.2.5 403 response to REGISTER from an un-trusted domain with topology hiding

Interoperability Test Description		
Identifier:	TD_IMS_0004H	
Summary:	IMS network sends 403 response when attempting registration from a different trust domain with topology hiding	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5411_01	ES 283 003 [1], clause 5.10.3.1 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • IMS_B configured for topology hiding • IMS_A and IMS_B are in different trust domains	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows unsuccessful registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5411_01 in CFW step 3 (REGISTER) [IBCF]: *ensure that {* *when { UE_B sends a valid REGISTER to IMS_B and IMS_B sends the REGISTER to IMS_A }* *then { IMS_B sends a 403_response to IMS_A }* *}*

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
1			→					User B activates the UE in a visited network
2				→			REGISTER	UE_B sends a REGISTER to IMS_A
3					→		**REGISTER**	**IMS_A forwards the REGISTER to IMS_B**
4					←		**403 Forbidden**	**IMS_B responds with 403 Forbidden to IMS_A**
5				←			403 Forbidden	IMS_A forwards the 403 Forbidden to UE_B
6			←					User B is informed about the registration is rejected

4.5.2.6 Network initiated re-registration with new contact information.

Interoperability Test Description		
Identifier:	TD_IMS_0005	
Summary:	IMS network supports network initiated re-registration upon receipt of a new registration with new contact information	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5088_01	ES 283 003 [1], clause 5.4.1.2.1 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B has been registered using any user identity in IMS_B via IMS_A but has then physically unplugged, i.e. without de-registration • UE_B is configured to use AKA authentication	
Test Sequence:	**Step**	
	1	UE_B is physically connected to IMS_B
	2	Verify that UE_B shows successful registration

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5088_01 in CFW step 2 (REGISTER) and 6 (NOTIFY): *ensure that {* *when { UE_B sends an initial REGISTER to IMS_B* *containing an Authorization_header* *not containing an integrity-protected_parameter or* *containing an integrity-protected_parameter indicating no }* *then { IMS_B sends a NOTIFY to IMS_A* *containing a Request_URI* *indicating the P-CSCF_SIP_URI of IMS_A and* *containing an Event_header* *containing the reg_event_package and* *containing a Route_header* *indicating the original Route_header from SUBSCRIBE and* *containing a Message_Body* *containing for each registered_public_identity of UE_B* *a registration_element* *(containing an aor_attribute* *indicating registered_public_identity of UE_B and* *containing a state_attribute* *indicating terminated and* *containing a contact_subelement* *(containing an event_attribute* *indicating deactivated or rejected* *containing a state_attribute indicating terminated and* *containing a URI_subelement* *indicating the contact_address of UE_B)* *) }* *}*

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
								User B connects UE_B to IMS_B
29				→	→		**REGISTER**	**UE_B sends a REGISTER to IMS_B**
30				←	←		401 Unauthorized	IMS_B responds with 401 Unauthorized to UE_B
31				→	→		REGISTER	UE_B sends a REGISTER to IMS_B
32				←	←		200 OK	IMS_B responds with 200 OK to UE_B
33					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A**
34					→		200 OK	IMS_A responds with a 200 OK IMS_B
35			←					User B is informed about the successful re-registration

4.5.2.7 Network initiated deregistration by the S-CSCF

Interoperability Test Description		
Identifier:	TD_IMS_0006	
Summary:	IMS network can initiate user de-registration, e.g., when a user runs out of credit	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5093_01	ES 283 003 [1], clause 5.4.1.5 ¶6
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B registered in IMS_B via IMS_A using any user identity • IMS_A within the trust domain of IMS_B	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	IMS_B is triggered manually to de-register user B
	2	Verify that UE_B shows successful de-registration
Conformance Criteria:	**Check**	
	1	TP_IMS_5093_01 in CFW step 23 and 27 *ensure that {* *when { IMS_B receives an network_originated_deregistration_event }* *then {* *IMS_B sends a NOTIFY to IMS_A* *containing a Request_URI* *indicating UE_B and* *containing an Event_header* *indicating the reg_event_package and* *containing a Route_header* *indicating the original Route_header from SUBSCRIBE and* *containing a Message_Body* *containing for each registered_public_identity of UE_B* *a registration_element* *(containing an aor_attribute* *indicating registered_public_identity of UE_B and* *containing a state_attribute* *indicating terminated and* *containing a contact_subelement* *(containing an event_attribute* *indicating deactivated or rejected* *containing a state_attribute indicating terminated and* *containing an URI_subelement* *indicating the contact_address of UE_B) and* *IMS_B sends a NOTIFY to IMS_A* *containing a Request_URI* *indicating P-CSCF_SIP_URI of IMS_A and* *containing an Event_header* *indicating the reg_event_package and* *containing a Route_header* *indicating the original Route_header from SUBSCRIBE and* *containing a Message_Body* *containing for each registered_public_identity of UE_B* *a registration_element* *(containing an aor_attribute* *indicating registered_public_identity of UE_B and* *containing a state_attribute* *indicating terminated and* *containing a contact_subelement* *(containing an event_attribute* *indicating deactivated or rejected and* *containing a state_attribute indicating terminated and* *containing an URI_subelement* *indicating the contact_address of UE_B) }* *}*

Step	Direction						Message	Comment
			User B	**UE B**	**IMS A**	**IMS B**		
								IMS_B is triggered to de-register user B
23					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing UE_B's de-registration**
24				←			NOTIFY	IMS_B sends a NOTIFY to UE_B, containing UE_B's de-registration
25				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
26					→		200 OK	IMS_A forwards the 200 OK to IMS_B

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
27					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing IMS_A's de-registration
28					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
29			←					User B is informed about de-registration

4.5.2.8 Network initiated re-authentication by the S-CSCF

Interoperability Test Description		
Identifier:	TD_IMS_0007	
Summary:	IMS network can initiate user re-authentication	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5094_01	ES 283 003 [1], clause 5.4.1.6 ¶2
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B registered in IMS_B using any user identity • IMS_A within the trust domain of IMS_B • Event received in S-CSCF of IMS_B to re-authenticate UE_B	
Test Sequence:	**Step**	
	1	IMS_B network is triggered to re-authenticate user B
	2	Verify that UE_B shows successful registration

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5094_01 in CFW steps 23 and 27 *ensure that {* *when { IMS_B receives an network_originated_reauthentication_event }* *then {* *IMS_B sends a NOTIFY to UE_B* *containing a Request_URI* *indicating UE_B and* *containing an Event_header* *indicating the reg_event_package and* *containing a Route_header* *indicating the original Route_header from SUBSCRIBE and* *containing a Message_Body* *containing for each registered_public_identity of UE_B* *a registration_element* *(containing an aor_attribute* *indicating a registered_public_identity of UE_B and* *containing a state_attribute* *indicating active and* *containing a contact_subelement* *(containing an event_attribute* *indicating shortened and* *containing a state_attribute indicating active and* *containing an URI_subelement* *indicating the contact_address of UE_B and* *containing an expiry_attribute) and* *IMS_B sends a NOTIFY to IMS_A -- P-CSCF* *containing a Request_URI* *indicating the P-CSCF_SIP_URI of IMS_A and* *containing an Event_header* *indicating the reg_event_package and* *containing a Route_header* *indicating the original Route_header from SUBSCRIBE and* *containing a Message_Body* *containing for each registered_public_identity of UE_B* *a registration_element* *(containing an aor_attribute* *indicating a registered_public_identity of UE_B and* *containing a state_attribute* *indicating active and* *containing a contact_subelement* *(containing an event_attribute* *indicating shortened and* *containing a state_attribute indicating active and* *containing an URI_subelement* *indicating the contact_address of UE_B and* *containing an expiry_attribute) }* *}*

Step	Direction						Message	Comment
			User B	UE B	IMS A	IMS B		
								IMS_B is triggered to re-authenticate user B
23					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing UE_B's re-authentication**
24				←			NOTIFY	IMS_B sends a NOTIFY to UE_B, containing UE_ re-authentication
25				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
26					→		200 OK	IMS_A forwards the 200 OK to IMS_B
27					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing IMS_A's re-authentication**
28					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
29				→			REGISTER	UE_B sends REGISTER containing authentication challenge response to IMS_A
30					→		REGISTER	IMS_A forwards the REGISTER to IMS B
231					←		200 OK	IMS_B responds with 200 OK
32				←			200 OK	IMS_A forwards the 200 OK response to UE_B
33					→		SUBSCRIBE	IMS_A sends a SUBSCRIBE to IMS_B
34					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
35					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
36					→		200 OK	IMS_A responds to the NOTIFY with a 200 OK
37				→			SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
38					→		SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_B
39					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
40				←			200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
41					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
42				←			NOTIFY	IMS_A forwards the NOTIFY to UE_B
43				→			200 OK	UE_B responds to the NOTIFY with a 200 OK
44					→		200 OK	IMS_A forwards the 200 OK to IMS_B
45			←					User B is informed about successful registration

4.5.2.9 First time registration in a visited IMS network with topology hiding

Interoperability Test Description		
Identifier:	TD_IMS_0008	
Summary:	First time registration via a visited IMS network with topology hiding	
Configuration:	CF_ROAM_REG	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5134_01	ES 283 003 [1], clause 5.10.4.1 ¶5
	TP_IMS_5405_01	ES 283 003 [1], clause 5.10.2.2 ¶1
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B is not registered • IMS_A is configured for topology hiding	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows successful registration

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5134_01 in CFW step 3, 7 (REGISTER): *ensure that {* *when { UE_B sends a REGISTER to IMS_A }* *then { IMS_A sends the REGISTER to IMS_B* *containing an additional topmost Path_header* *indicating the IBCF_SIP_URI of IMS_A }* *}*
	3	TP_IMS_5405_01 in CFW step 10, 15 (SUBSCRIBE): *ensure that {* *when { UE_B sends a SUBSCRIBE to IMS_B }* *then { IMS_A sends the SUBSCRIBE to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *not containing (a P-Charging-Vector_header and* *a P-Charging-Function-Addresses_header) }* *}*

Step	Direction	Message	Comment
	User B / UE B / IMS A / IMS B		
1	→ UE B		User B registers in IMS B
2	UE B → IMS A	REGISTER	UE_B sends a REGISTER to IMS_A
3	IMS A → IMS B	**REGISTER**	**IMS_A forwards the REGISTER to IMS_B**
4	IMS B → IMS A	401 Unauthorized	IMS_B responds with 401 Unauthorized to IMS_A
5	IMS A → UE B	401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
6	UE B → IMS A	REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
7	IMS A → IMS B	**REGISTER**	**IMS_A forwards the REGISTER to IMS B**
8	IMS B → IMS A	200 OK	IMS_B responds with 200 OK
9	IMS A → UE B	200 OK	IMS_A forwards the 200 OK response to UE_B
10	IMS A → IMS B	**SUBSCRIBE**	**IMS_A sends a SUBSCRIBE to IMS_B**
11	IMS B → IMS A	200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
12	IMS B → IMS A	NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
13	IMS A → IMS B	200 OK	IMS_A responds to the NOTIFY with a 200 OK
14	UE B → IMS A	SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
15	IMS A → IMS B	**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE request to IMS_B**
16	IMS B → IMS A	200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
17	IMS A → UE B	200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
18	IMS B → IMS A	NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
19	IMS A → UE B	NOTIFY	IMS_A forwards the NOTIFY to UE_B
20	UE B → IMS A	200 OK	UE_B responds to the NOTIFY with a 200 OK
21	IMS A → IMS B	200 OK	IMS_A forwards the 200 OK to IMS_B
22			User B is informed about successful registration

4.5.3 Initial Dialog or Subsequent Procedures

4.5.3.1 Initial INVITE Dialog Procedures

4.5.3.1.1 Initial INVITE Request Procedures - Originating

4.5.3.1.1.1 Default SIP URI

Interoperability Test Description		
Identifier:	TD_IMS_0009	
Summary:	IMS network can handle establishment of dialogs for users with default SIP URIs and resolve Tel URI E.164 numbers	
Configuration:	CF_INT_CALL	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_01	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_02	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_04	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_03	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_04	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	ES 283 003 [1], clause 5.3.2.1 ¶37
	TP_IMS_5131_02	ES 283 003 [1], clause 5.3.2.1 ¶37
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A as userSIP_priv according to table 1 • UE_B is registered in IMS_B as userSIP_priv according to table 1 • IMS_A within the trust domain of IMS_B • Common DNS is configured with an ENUM entry for the Tel URI E.164 Number of userSIP of IMS_B	
Test Sequence:	**Step**	
	1	User A calls user B's Tel_URI (i.e. userSIP in IMS_B)
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers the call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that the call is established
	7	User A ends the call
	8	Verify with UE_B that call has been released
	9	Verify with UE_A that call has been released

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid_parameter and* *containing a orig-ioi_parameter indicating IMS_A and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*
	2	TP_IMS_5097_02 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI of UE_A}* *then { IMS_B receives the initial INVITE* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI of UE_A }* *}*
	3	TP_IMS_5097_04 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B* *containing a Request_URI* *indicating a Tel_URI}* *then { IMS_A sends a DNS_Query to DNS* *containing the Tel_URI_E.164_Number }* *when { IMS_A receives DNS_Response from DNS* *containing a NAPTR_Resource_Record* *indicating the SIP_URI of UE_B }* *then { IMS_A sends the initial INVITE to IMS_B* *containing a Request_URI* *indicating the SIP_URI of UE_B* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	4	TP_IMS_5107_02 in CFW step 19 (ACK): *ensure that {* *when { UE_A sends ACK to UE_B }* *then { IMS_B receives the ACK* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*
	5	TP_IMS_5107_01 in CFW step 24A (BYE): *ensure that {* *when { UE_A sends BYE to UE_B }* *then { IMS_B receives the BYE* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*

Interoperability Test Description		
	6	TP_IMS_5115_01 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_A receives the 180_response from IMS_B* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	7	TP_IMS_5115_03 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 1xx_response to UE_A* *(not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a SIP_URI of UE_B) }* *then { IMS_A receives the 1xx_response from IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI of UE_BI }* *}*
	8	TP_IMS_5115_02 in CFW step 15 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	9	TP_IMS_5115_04 in CFW step 15 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A* *(not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI of UE_B) }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_B and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI of UE_B}* *}*
	10	TP_IMS_5131_01 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *not containing a P-Charging-Function-Addresses_header }* *}*
	11	TP_IMS_5131_02 in CFW step 15 (2xx) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}* *}*

Step	Direction							Message	Comment
	User A	UEA	IMSA	DNS	IMSB	UEB	User B		
1	→								User A calls User B
2		→						INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←						100 Trying	IMS_A responds with a 100 Trying provisional response
4a			→					DNS QUERY	IMS_A sends DNS QUERY to common DNS containing E.164 TEL URI
4b			←					DNS RESPONSE	Common DNS sends DNS RESPONSE containing NAPTR resource record to IMS_A
5			→		→			**INVITE**	**IMS_A forwards INVITE to IMS_B**
6			←		←			100 Trying	IMS_B responds with a 100 Trying provisional response
7						→		INVITE	IMS_B forwards INVITE to UE_B
8							→		User B is informed of incoming call of User A
9					←	←		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←		←			**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
11		←	←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←	←							User A is informed that UE_B is ringing
13					←	←			User B answers call
14			←		←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
15		←	←					**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
16	←	←						200 OK	IMS_A forwards the 200 OK response to UE_A
17	→								User A is informed that call has been answered
18		→	→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19			→		→			**ACK**	**IMS_A forwards ACK to IMS_B**
20						→		ACK	IMS_B forwards ACK to UE_B
21						→	→		User B is informed that the call is established
22A	→	→							User A ends call
23A		→	→					BYE	UE_A releases the call with BYE
24A			→		→			**BYE**	**IMS_A forwards BYE to IMS_B**
25A						→		BYE	IMS_B forwards BYE to UE_B
26A							→		User B is informed that call has ended
27A					←	←		200 OK	UE_B sends 200 OK for BYE
28A			←		←			200 OK	IMS_B forwards 200 OK response to IMS_A
29A		←	←					200 OK	IMS_A forwards the 200 OK response to UE_A
30A	←	←							User B is informed that call has ended

4.5.3.1.1.2 Default SIP URI

Interoperability Test Description		
Identifier:	TD_IMS_0009F	
Summary:	IMS network can handle establishment of a call when the call is being offered to multiple terminals	
Configuration:	CF_INT_CALL	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_01	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_02	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_04	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_03	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_04	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	ES 283 003 [1], clause 5.3.2.1 ¶37
	TP_IMS_5131_02	ES 283 003 [1], clause 5.3.2.1 ¶37
Use Case ref.:	UC_12_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A as userSIP_priv according to table 1 • UE_B is registered in IMS_B via UE_B1 and UE_B2 as userSIP according to table 1 • IMS_A within the trust domain of IMS_B	
Test Sequence:	**Step**	
	1	User A calls User B
	2	User B is informed of incoming call of User A on UE_B1
	3	User B is informed of incoming call of User A on UE_B2
	4	User A is informed that a UE of User B is ringing
	5	User B answers call on UE_B2
	6	User B is informed at UE_B1 that the call is no longer offered
	7	User A is informed that call has been answered
	8	User B is informed that the call is established
	9	User A ends the call
	10	Verify with UE_B that call has been released
	11	Verify with UE_A that call has been released
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid_parameter and* *containing a orig-ioi_parameter indicating IMS_A and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*

Interoperability Test Description		
	3	TP_IMS_5107_02 in CFW step 28 (ACK): *ensure that {* *when { UE_A sends ACK to UE_B }* *then { IMS_B receives the ACK* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*
	4	TP_IMS_5107_01 in CFW step 33A (BYE): *ensure that {* *when { UE_A sends BYE to UE_B }* *then { IMS_B receives the BYE* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*
	5	TP_IMS_5115_01 in CFW step 10 and 17 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_A receives the 180_response from IMS_B* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	6	TP_IMS_5115_02 in CFW step 24 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	7	TP_IMS_5131_01 in CFW step 10 and 17 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *not containing a P-Charging-Function-Addresses_header }* *}*
	8	TP_IMS_5131_02 in CFW step 25 (2xx) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A calls User B
2		→	→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←	←				100 Trying	IMS_A responds with a 100 Trying provisional response
4			→	→			**INVITE**	**IMS_A forwards INVITE to IMS_B**
5			←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
6				→	→		INVITE	IMS_B forwards INVITE to UE_B1
7				←	←		100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
8					→	→		User B is informed on UE_B1 of incoming call of User A
9				←	←		180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←	←			**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
11		←	←				180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←	←						User A is informed that a UE of User B is ringing
13				→	→		INVITE	IMS_B forwards INVITE to UE_B2
14				←	←		100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
15					→	→		User B is informed on UE_B2 of incoming call of User A
16				←	←		180 Ringing	UE_B2 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
17			←	←			**180 Ringing**	**IMS_B forwards 2nd 180 Ringing response to IMS_A**
18		←	←				180 Ringing	IMS_A forwards the 2nd 180 Ringing response to UE_A
19					←	←		User B answers call at UE_B2
20				←	←		200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
21				→	→		CANCEL	IMS_B sends CANCEL request to UE_B1
22				←	←		200 OK	UE_B1 sends 200 OK response to the CANCEL request to IMS_B
23					→	→		UE_B1 informs user B that the call is no longer offered to this UE and stops ringing
24			←	←			**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
25		←	←				200 OK	IMS_A forwards the 200 OK response to UE_A
26	←	←						User A is informed that call has been answered
27		→	→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
28			→	→			**ACK**	**IMS_A forwards ACK to IMS_B**
29				→	→		ACK	IMS_B forwards ACK to UE_B
30					→	→		User B is informed that the call is established
31A	→							User A ends call
32A		→	→				BYE	UE_A releases the call with BYE
33A			→	→			**BYE**	**IMS_A forwards BYE to IMS_B**
34A				→	→		BYE	IMS_B forwards BYE to UE_B
35A					→	→		User B is informed that call has ended
36A				←	←		200 OK	UE_B sends 200 OK for BYE
37A			←	←			**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
38A		←	←				200 OK	IMS_A forwards the 200 OK response to UE_A
39A	←	←						User A is informed that call has ended

4.5.3.1.1.3 Default Tel URI

Interoperability Test Description		
Identifier:	TD_IMS_0010	
Summary:	IMS network can handle establishment of dialogs for users with default TEL URIs	
Configuration:	CF_INT_CALL	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_01	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_03	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	ES 283 003 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_05	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_06	ES 283 003 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	ES 283 003 [1], clause 5.4.3.3 ¶37
	TP_IMS_5131_02	ES 283 003 [1], clause 5.3.2.1 ¶37
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userTEL_priv according to table 1 • UE_B is registered in IMS_B using userTEL_priv according to table 1 • IMS_A within the trust domain of IMS_B	
Test Sequence:	**Step**	
	1	User A calls user B (i.e. userTEL in IMS_B)
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers the call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that the call is established
	7	User A ends the call
	8	Verify with UE_B that call has been released
	9	Verify with UE_A that call has been released
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid_parameter and* *containing a orig-ioi_parameter indicating IMS_A and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*

Interoperability Test Description		
	2	TP_IMS_5097_03 in CFW step 4 (INVITE) *ensure that {* *when { UE_A sends an initial INVITE to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI of UE_A }* *then { IMS_B receives the initial INVITE* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI of UE_A}* *}*
	3	TP_IMS_5107_02 in CFW step 19 (ACK): *ensure that {* *when { UE_A sends ACK to UE_B }* *then { IMS_B receives the ACK* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*
	4	TP_IMS_5107_01 in CFW step 24A (BYE): *ensure that {* *when { UE_A sends BYE to UE_B }* *then { IMS_B receives the BYE* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing a P-Access-Network-Info_header }* *}*
	5	TP_IMS_5115_01 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_A receives the 180_response from IMS_B* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B*
	6	TP_IMS_5115_05 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 1xx_response to UE_A* *(not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI) }* *then { IMS_A receives the 1xx_response* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI }* *}*
	7	TP_IMS_5115_02 in CFW step 15 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*

Interoperability Test Description		
	8	TP_IMS_5115_06 in CFW step 15 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A* *(not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI) }* *then { IMS_A receives the 2xx_response* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI }* *}*
	9	TP_IMS_5131_01 in CFW step 10 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *not containing a P-Charging-Function-Addresses_header }* *}*
	10	TP_IMS_5131_01 in CFW step 15 (2xx) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1		→						User A calls User B
2			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3			←				100 Trying	IMS_A responds with a 100 Trying provisional response
4				→			**INVITE**	**IMS_A forwards INVITE to IMS_B**
5				←			100 Trying	IMS_B responds with a 100 Trying provisional response
6					→		INVITE	IMS_B forwards INVITE to UE_B
7					←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
8						→		User B is informed of incoming call of User A
9					←		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10				←			**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
11			←				180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13					←			User B answers call
14				←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
15			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
16		←					200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
19				→			**ACK**	**IMS_A forwards ACK to IMS_B**
20					→		ACK	IMS_B forwards ACK to UE_B
21						→		User B is informed that the call is established
22A	→							User A ends call
23A		→					BYE	UE_A releases the call with BYE
24A			→				**BYE**	**IMS_A forwards BYE to IMS_B**
25A				→			BYE	IMS_B forwards BYE to UE_B
26A						→		User B is informed that call has ended
27A					←		200 OK	UE_B sends 200 OK for BYE
28A				←			200 OK	IMS_B forwards 200 OK response to IMS_
29A			←				200 OK	IMS_A forwards the 200 OK response to UE_A
30A						→		User B is informed that call has ended

4.5.3.1.1.4 Rejection of call from barred user

Interoperability Test Description		
Identifier:	TD_IMS_0011	
Summary:	IMS network does not establish call to barred user	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_05	ES 283 003 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • IMS_A within the trust domain of IMS_B • User B has two public identities in IMS_B out of which one of has been barred	
Test Sequence:	**Step**	
	1	User A calls user B using barred user identity
	2	Verify that user A is informed that call cannot be established
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_05 in CFW step 6 (404 response): *ensure that {* *when { UE_A sends an initial INVITE to UE_B and* *IMS_A sends the INVITE to IMS_B* *containing a Request_URI* *indicating a barred_user in IMS_B }* *then { IMS_B sends 404_response to IMS_A }* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1	→							User A calls User B
2		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6			←				**404 Not Found**	**IMS_B responds to the INVITE with 404 Not Found**
7		←					404 Not Found	IMS_A forwards the 404 Not Found response to UE_A
8	←							User A is informed that call has failed
9		→					ACK	UE_A acknowledges the response
10			→				ACK	IMS_A forwards the ACK to IMS_B

4.5.3.1.1.5 Rejection of call to non-existing user

Interoperability Test Description		
Identifier:	TD_IMS_0012	
Summary:	IMS network rejects call to non existing user	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5132_01	ES 283 003 [1], clause 5.3.2.1 ¶28
Use Case ref.:	UC_01_I	
Pre-test conditions:	• HSS of IMS_A and is configured according to table 1 • UE_A have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • IMS_A within the trust domain of IMS_B	
Test Sequence:	**Step**	
	1	User A calls user B indicating a non existing identity within IMS_B domain
	2	Verify that user A is informed that call cannot be established
Conformance Criteria:	**Check**	
	1	TP_IMS_5132_01 in CFW step 6 (404 Not Found): *ensure that {* *when { UE_A sends an initial INVITE* *containing a Request_URI* *indicating a non_existing_user in IMS_B and* *IMS_A sends the INVITE to IMS_B }* *then { IMS_B sends an appropriate (e.g. 404 or 604) to IMS_A }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1	→							User A calls User B
2		→					**INVITE**	**UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports**
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6			←				**404 Not Found**	**IMS_B responds with 404 Not Found to IMS_A**
7		←					404 Not Found	IMS_A forwards the 404 Not Found response to UE_A
8	←							User A is informed that called user does not exist
9		→					ACK	UE_A acknowledges the receipt of a 404 final response
10			→				ACK	IMS_A forwards the ACK to IMS_B

4.5.3.1.1.6 Rejection of call to unavailable user

Interoperability Test Description		
Identifier:	TD_IMS_0013	
Summary:	IMS network does not establish a call for unavailable user	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5133_01	ES 283 003 [1], clause 5.3.2.1 ¶29
Use Case ref.:	UC_01_I	
Pre-test conditions:	• HSS of IMS_A and IMS_B is configured according to table 1 • UE_A has IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is not registered in IMS_B	
Test Sequence:	**Step**	
	1	User A calls a valid user B identity
	2	Verify that user A is informed that user B is not reachable or equivalent
Conformance Criteria:	**Check**	
	1	TP_IMS_5133_01 in CFW step 6 (4xx): *ensure that {* *when { UE_A sends INVITE to UE_B }* *then { IMS_B sends a 4xx_response to IMS_A }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1	→							User A calls User B
2		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6			←				**4xx**	**IMS_B responds with 4xx to IMS_A**
7		←					4xx	IMS_A forwards the 4xx response to UE_A
8	←							User A is informed that called user is not reachable or equivalent
9		→					ACK	UE_A acknowledges the receipt of a 4xx final response
10			→				ACK	IMS_A forwards the ACK to IMS_B

4.5.3.1.1.7 Initial request to non-registered user with terminating unregistered filter criterion

Test Description		
Identifier:	TD_IMS_0014	
Summary:	IMS network can handle initial request to non-registered user with terminating unregistered filter criterion	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5109_01	ES 283 003 [1], clause 5.3.2.1 ¶33
Use Case Ref.:	UC_01_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A has no filter criteria defined in HSS • IMS_B has terminating unregistered criterion set for UE_B on INVITE indicating SESSION_TERMINATED option and forward the INVITE to AS_B • AS_B is unreachable from IMS_B • UE_A registered using any user identity • UE_B not registered as userNOAS_priv according to table 1	
Test Sequence:	**Step**	
	1	User A calls user B (i.e. userNOAS in IMS_B)
	2	Verify that user A is informed that call cannot be established
Pass Criteria:	**Check**	
	1	TP_IMS_5109_01 in CFW step 6 (Error Response): *ensure that {* *when { UE_A sends INVITE to UE_B }* *then { IMS_B receives the INVITE and* *sends (a 408_response or a 5xx_response) to IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1		→						User A calls User B
2			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3			←				100 Trying	IMS_A responds with a 100 Trying provisional response
4				→			INVITE	IMS_A forwards INVITE to IMS_B
5				←			100 Trying	IMS_B responds with a 100 Trying provisional response
6				←			**408 Request Timeout or 5xx Response**	**IMS_B responds with 4xx to IMS_A**
7			←				408 Request Timeout or 5xx Response	IMS_A forwards the 4xx response to UE_A
8	←							User A is informed that called user is not reachable

4.5.3.1.2 Dialogue Procedures with Roaming

4.5.3.1.2.1 Normal call

Interoperability Test Description		
Identifier:	TD_IMS_0015	
Summary:	IMS network handles normal call while UE_B is roaming without topology hiding correctly	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5046_01	ES 283 003 [1], clause 5.2.6.3 ¶4
	TP_IMS_5067_01	ES 283 003 [1], clause 5.2.7.2 ¶7
	TP_IMS_5070_01	ES 283 003 [1], clause 5.2.7.3 ¶6
	TP_IMS_5301_01	ES 283 003 [1], clause 5.4.3.3 ¶56
	TP_IMS_5055_01	ES 283 003 [1], clause 5.2.6.4 ¶15
	TP_IMS_5055_02	ES 283 003 [1], clause 5.2.6.4 ¶15
	TP_IMS_5108_01	ES 283 003 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_02_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to IMS_A as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity • IMS_A within the trust domain of IMS_B • A Service-Route header list exists for UE_B in P-CSCF	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User B
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user B is informed that call has been answered
	6	Verify that user A is informed that the call is established
	7	User A ends call
	8	Verify that user B is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5046_01 in CFW step 4 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing an additional Via_header* *containing (the P-CSCF_via_port_number and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *containing an additional topmost Record-Route_header* *indicating (the P-CSCF_port_number* *'where it awaits subsequent requests' from UE_A and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *indicating the "list of Service Route header URIs* *from the registration" and* *not containing P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *containing an address of UE_A and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 4 *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*
	3	TP_IMS_5070_01 in CFW step 7 (100 Trying) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends a 100_response to IMS_B* *}* *}*
	4	TP_IMS_5301_01 in CFW step 29A (BYE) *ensure that {* *when { IMS_A receives a BYE from UE_A* *}* *then { IMS_A sends the BYE* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a topmost Record-Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *}* *}*
	5	TP_IMS_5055_01 in CFW step 12 (180 Ringing) *ensure that {* *when { IMS_A receives a 180_response from UE_B }* *then { IMS_A sends a 180_response to IMS_B* *containing a Record-Route_header* *containing the P-CSCF_port_number of IMS_A* *"where it expects subsequent requests" and* *not containing a comp_parameter and* *not containing a P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *indicating the address "sent in P-Called_Party-ID header* *sent in the initial request" }* *}*

Interoperability Test Description		
	6	TP_IMS_5055_02 in CFW step 18 (200 OK) *ensure that {* *when { IMS_A receives a 200_response from UE_B }* *then { IMS_A sends the 200_response to IMS_B* *containing a Record-Route_header* *containing the P-CSCF_port_number of IMS_A* *"where it expects subsequent requests" and* *not containing a comp_parameter and* *not containing a P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *indicating the address "sent in P-Called_Party-ID header* *sent in the initial request"* *}* *}*
	7	TP_IMS_5108_01 in CFW step 6 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B* *IMS_A sends the INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *then { IMS_B sends the INVITE to IMS_A* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_B and* *containing a P-Charging-Vector_header* *containing the same icid_parameter and* *not containing ioi_parameters* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI of IMS_B }* *}*

Step	Direction						Message	Comment
	User A	**UE A**	**User B**	**UE B**	**IMS A**	**IMS B**		
1			←					User B calls User A
2				→			INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3				←			100 Trying	IMS_A responds with a 100 Trying provisional response
4					→		**INVITE**	**IMS_A forwards INVITE to IMS_B**
5					←		100 Trying	IMS_B responds with a 100 Trying provisional response
6					←		**INVITE**	**IMS_B forwards the INVITE to IMS_A**
7					→		**100 Trying**	**IMS_A responds with a 100 Trying provisional response**
8		←					INVITE	IMS_A forwards the INVITE to UE_A
9		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
10	←							User A is informed of incoming call of User B
11		→					180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12					→		**180 Ringing**	**IMS_A forwards 180 Ringing response to IMS_B**
13					←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14				←			180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
15			←					User B is informed that UE_A is ringing
16	→							User A answers call
17		→					200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
18					→		**200 OK**	**IMS_A forwards 200 OK response to IMS_B**
19					←		200 OK	IMS_B forwards the 200 OK response to IMS_A
20				←			200 OK	IMS_A forwards the 200 OK response to UE_B
21			←					User B is presented that call in process
22				→			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
23					→		ACK	IMS_A forwards ACK to IMS_B
24					←		ACK	IMS_B forwards ACK to IMS_A
25		←					ACK	IMS_A forwards ACK to UE_A
26	←							User A is informed that the call is in progress
27A	→							User A ends call
28A					→		BYE	UE_A releases the call with BYE
29A					→		**BYE**	**IMS_A forwards BYE to IMS_B**
30A					←		BYE	IMS_B forwards BYE to IMS_A
31A				←			BYE	IMS_A forwards BYE to UE_B
32A			←					User B is informed that call has ended

4.5.3.1.2.2 Normal call with hold/resume

Interoperability Test Description		
Identifier:	TD_IMS_0016	
Summary:	IMS network handles subsequent INVITEs correctly in case of a user initiated call hold and resume when home caller puts roaming user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5081_01	ES 283 003 [1], clause 5.2.9.2 ¶1
	TP_IMS_5082_01	ES 283 003 [1], clause 5.2.9.2 ¶2
	TP_IMS_5120_01	ES 283 003 [1], clause 5.4.3.3 ¶48
Use Case ref.:	UC_03 R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using INVITE • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5081_01 in CFW step 41A and 60A (100 Trying): *ensure that {* *when { UE_A sends a subsequent INVITE to UE_B and* *IMS_A receives the INVITE from IMS_B }* *then { IMS_A sends a 100_response to IMS_B }* *}*
	2	TP_IMS_5082_01 in CFW step 46A and 65A (200 OK): *ensure that {* *when { IMS_A receives a 200_response from UE_B }* *then { IMS_A sends the 200_response to IMS_B* *containing a P-Charging-Vector_header* *containing an updated* *access-network-charging-info_parameter* *}* *}*
	3	TP_IMS_5120_01 in CFW step 40A and 59A (INVITE): *ensure that {* *when { UE_A sends a subsequent INVITE to UE_B }* *then { IMS_A receives the INVITE from IMS_B* *not containing a topmost Route_header* *containing the S-CSCF_SIP_URI* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI }* *}*

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
34	←							User B is presented that call is in progress
35A	→							User A puts call on hold
36A		→			→		INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
37A		←			←		100 Trying	IMS_A responds with a 100 Trying provisional response
38A					→		INVITE	IMS_A forwards INVITE to IMS_B
39A					←		100 Trying	IMS_B responds with a 100 Trying provisional response
40A					←		**INVITE**	**IMS_B forwards INVITE to IMS_A**
41A					→		**100 Trying**	**IMS_A responds with a 100 Trying provisional response**
42A				←	←		INVITE	IMS_A forwards INVITE to UE_B
43A				→	→		100 Trying	UE_B optionally responds with a 100 Trying provisional response
44A			←					User B is informed that call is on hold
45A				→	→		200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
46A					→		**200 OK**	**IMS_A forwards 200 OK response to IMS_B**
47A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
48A		←			←		200 OK	IMS_A forwards the 200 OK response to UE_A
49A		→			→		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
50A					→		ACK	IMS_A forwards ACK to IMS_B
51A					←		ACK	IMS_B forwards ACK to IMS_A
52A				←	←		ACK	IMS_A forwards ACK to UE_B
53A	←							User A is informed that call is on hold
54A	→							User A resumes call
55A		→			→		INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
56A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
57A						→	INVITE	IMS_A forwards INVITE to IMS_B
58A					←		100 Trying	IMS_B responds with a 100 Trying provisional response
59A					←		**INVITE**	**IMS_B forwards INVITE to IMS_A**
60A						→	**100 Trying**	**IMS_A responds with a 100 Trying provisional response**
61A				←			INVITE	IMS_A forwards INVITE to UE_B
62A				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
63A			←					User B is informed that call is resumed
64A				→			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
65A						→	**200 OK**	**IMS_A forwards 200 OK response to IMS_B**
66A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
67A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
68A	←							User A is informed that call is resumed

4.5.3.1.2.3 Subsequent request (other than target refresh)

Interoperability Test Description		
Identifier:	TD_IMS_0017	
Summary:	IMS network handles routing information in subsequent requests (other than target refresh) received from the UE before forwarding them to another IMS network.	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5052_01	ES 283 003 [1], clause 5.2.6.3 ¶56
Use Case ref.:	UC_02_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_B has IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User B
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user B is informed that call has been answered
	6	Verify that user A is informed that the call is established
	7	User B ends call
	8	Verify that user A is informed that call has ended
	9	Verify that user B is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5052_01 in CFW step 29B (BYE): *ensure that {* *when { IMS_A receives a BYE from UE_B }* *then { IMS_A sends the BYE to IMS_B* *not containing a Route_header* *indicating the P-CSCF_SIP_URI of IMS_A and* *containing the same Record-Route_header* *as in the previous ACK* *}* *}*

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
27B			←					User B ends call
28B				←			BYE	UE_B releases the call with BYE
29B					→		**BYE**	**IMS_A forwards BYE to IMS_B**
30B					←		BYE	IMS_B forwards BYE to IMS_A
31B		←					BYE	IMS_A forwards BYE to UE_A
32B	←							User A is informed that call has ended

4.5.3.1.2.4 Subsequent target refresh request (INVITE)

Interoperability Test Description		
Identifier:	TD_IMS_0018	
Summary:	IMS network handles subsequent INVITEs correctly in case of a user initiated call hold and resume when roaming caller puts a home user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5048_01	ES 283 003 [1], clause 5.2.6.3 ¶26
	TP_IMS_5080_01	ES 283 003 [1], clause 5.2.9.1 ¶2
Use Case ref.:	UC_03_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_B configured to perform user initiated hold/resume using INVITE • UE_A registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User B
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user B is informed that call has been answered
	6	Verify that user A is informed that call is established
	7	User B puts call on hold
	8	Verify that user A is informed that call is on hold
	9	Verify that user B is informed that call is on hold
	10	User B resumes call
	11	Verify that user A is informed that call is resumed
	12	Verify that user B is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5048_01 in CFW step 38B and 57B (INVITE): *ensure that {* *when { IMS_A receives a subsequent INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing an additional topmost Record-Route_header* *containing (the P-CSCF_port_number "where it awaits subsequent requests" from UE_A and (the P-CSCF-FQDN_address or the P-CSCF-IP_address)) of IMS_A and* *containing an additional Via_header* *containing (the P-CSCF_via_port_number and (the P-CSCF-FQDN_address or the P-CSCF-IP_address)) of IMS_A }* *}*
	2	TP_IMS_5080_01 in CFW step 38B and 57B (INVITE): *ensure that {* *when { IMS_A receives subsequent INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing an updated access-network-charging-info_parameter}* *}*

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
35B			←					User B puts call on hold
36B				→			INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
37B				←			100 Trying	IMS_A responds with a 100 Trying provisional response
38B					→		**INVITE**	**IMS_A forwards INVITE to IMS_B**
39B					←		100 Trying	IMS_B responds with a 100 Trying provisional response
40B					←		INVITE	IMS_B forwards INVITE to IMS_A
41B					→		100 Trying	IMS_A responds with a 100 Trying provisional response
42B		←					INVITE	IMS_A forwards INVITE to UE_A
43B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
44B	←							User A is informed that call is on hold
45B		→					200 OK	UE_A responds to INVITE with 200 OK indicating attribute "recvonly"
46B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
47B					←		200 OK	IMS_B forwards 200 OK response to IMS_A
48B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
49B				→			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
50B					→		ACK	IMS_A forwards ACK to IMS_B
51B					←		ACK	IMS_B forwards ACK to IMS_B
52B		←					ACK	IMS_A forwards ACK to UE_A
53B			←					User B is informed that call is on hold
54B			→					User B resumes call
55B				→			INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
56B				←			100 Trying	IMS_A responds with a 100 Trying provisional response
57B					→		**INVITE**	**IMS_A forwards INVITE to IMS_B**

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
58B					←		100 Trying	IMS_B responds with a 100 Trying provisional response
59B					←		INVITE	IMS_B forwards INVITE to IMS_A
60B					→		100 Trying	IMS_A responds with a 100 Trying provisional response
61B			←				INVITE	IMS_A forwards INVITE to UE_A
62B			→				100 Trying	UE_A optionally responds with a 100 Trying provisional response
63B		←						User A is informed that call is resumed

4.5.3.1.2.5 Subsequent target refresh request (UPDATE), roaming user initiated

Interoperability Test Description		
Identifier:	TD_IMS_0019	
Summary:	IMS network handles subsequent UPDATEs correctly in case of a user initiated call hold and resume when roaming caller puts a home user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5080_02	ES 283 003 [1], clause 5.2.9.1 ¶2
Use Case ref.:	UC_03_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_B has IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A registered in IMS_A • UE_B configured to perform user initiated hold/resume using UPDATE • UE_B is registered in IMS_B via IMS_A	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User A
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User B puts call on hold
	8	Verify that user A is informed that call is on hold
	9	Verify that user B is informed that call is on hold
	10	User B resumes call
	11	Verify that user A is informed that call is resumed
	12	Verify that user B is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5080_02 in CFW step 37B and 47B (UPDATE): *ensure that {* *when { IMS_A receives subsequent UPDATE from UE_B }* *then { IMS_A sends the UPDATE to IMS_B* *containing a P-Charging-Vector_header* *containing an updated access-network-charging-info_parameter}* *}*

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
35B			→					User B puts call on hold
36B				→			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
37B					→		**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
38B					←		UPDATE	IMS_B forwards UPDATE to IMS_A
39B		←					UPDATE	IMS_A forwards UPDATE to UE_A
40B	←							User A is informed that call on hold
41B		→					200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "recvonly"
42B					→		200 OK	IMS_A forwards 200 OK response to IMS_B
43B					←		200 OK	IMS_B forwards 200 OK response to IMS_A
44B				←			200 OK	IMS_A forwards the 200 OK response to UE_B
45B			→					User B resumes call
46B				→			UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
47B					→		**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
48B					←		UPDATE	IMS_B forwards UPDATE to IMS_A
49B		←					UPDATE	IMS_A forwards UPDATE to UE_A
50B	←							User A is informed that call is resumed

4.5.3.1.2.6 Subsequent target refresh request (UPDATE), home user initiated

Interoperability Test Description		
Identifier:	TD_IMS_0020	
Summary:	IMS network handles subsequent UPDATEs correctly in case of a user initiated call hold and resume when home caller puts a roaming user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5120_02	ES 283 003 [1], clause 5.4.3.3 ¶48
Use Case ref.:	UC_03_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using UPDATE • UE_A registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5120_02 in CFW step 38A and 49A (UPDATE): *ensure that {* *when { UE_A sends an UPDATE to UE_B }* *then { IMS_A receives the UPDATE from IMS_B* *not containing a topmost Route_header* *containing the S-CSCF_SIP_URI* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI }* *}*

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
35A	→							User A puts call on hold
36A		→			→		UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
37A					→		UPDATE	IMS_A forwards UPDATE to IMS_B
38A					←		**UPDATE**	**IMS_B forwards UPDATE to IMS_A**
39A				←			UPDATE	IMS_A forwards UPDATE to UE_B
40A			←					User B is informed that call is on hold
41A				→			200 OK	UE_B responds to with 200 OK indicating media attribute "recvonly"
42A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
43A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
44A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
45A	←							User A is informed that call is on hold
46A	→							User A resumes call
47A		→			→		UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
48A					→		UPDATE	IMS_A forwards UPDATE to IMS_B
49A					←		**UPDATE**	**IMS_B forwards UPDATE to IMS_A**
50A				←			UPDATE	IMS_A forwards UPDATE to UE_B
51A			←					User B is informed that call is resumed
52A				→			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
53A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
54A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
55A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
56A	←							User A is informed that call is resumed

4.5.3.1.2.7 Call CANCEL due to loss of connectivity of calling user during call establishment

Interoperability Test Description		
Identifier:	TD_IMS_0021	
Summary:	IMS network sends CANCEL to call destination in case that the calling UE looses connectivity during dialog initiation	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5072_02	ES 283 003 [1], clause 5.2.8.1.1 ¶1
Use Case ref.:	UC_02_R	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B has IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity • IMS_A is supporting (simulated) PDF or PCRF like functionality	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User B
	4	Verify that user B is informed that UE_A is ringing
	5	UE_B loses connectivity to IMS_A
	6	Verify that user A is informed that call has been cancelled
Conformance Criteria:	**Check**	

	1	TP_IMS_5072_02 in CFW step 18 (CANCEL):
		ensure that {
		when { IMS_A receives "an indication that UE_B is no longer available" }
		then { IMS_A sends a CANCEL to IMS_B
		containing a Reason_header
		containing a status_code_parameter
		indicating "503 Service unavailable"
		}
		}

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
10	←							User A is informed of incoming call of User B
11		→			→		180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
12						→	180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
13					←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
14				←			180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
15			←					User B is informed that UE_A is ringing
16								UE_B looses connectivity
17								IMS_A is informed about UE_B loosing connectivity
18						→	**CANCEL**	**IMS_A sends CANCEL to IMS_B**
19					←		200 OK	IMS_B responds with 200 OK to IMS_A
20					←		CANCEL	IMS_B forwards the CANCEL to IMS_A
21						→	200 OK	IMS_A responds with 200 OK to IMS_B
22		←					CANCEL	IMS_A forwards the CANCEL to UE_A
23					→		200 OK	UE_A responds with 200 OK to IMS_A
24	←							User A is informed that call has been cancelled
25		→			→		487 Request Terminated	UE_A sends 487 Request Terminated to IMS_A
26		←					ACK	IMS_A responds with ACK to UE_A
27						→	487 Request Terminated	IMS_A forwards the 487 Request Terminated to IMS_B
28					←		ACK	IMS_B responds with ACK to IMS_A

4.5.3.1.3 Subsequent Request Procedures - Originating Network

4.5.3.1.3.1 Call CANCEL by calling user

Interoperability Test Description		
Identifier:	TD_IMS_0022	
Summary:	IMS network handles correctly calling user cancelling call before its establishment	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5107_3	ES 283 003 [1], clause 5.4.3.2 ¶49
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User A cancels call
	5	Verify that user B is informed that call has been cancelled
	6	Verify that user A is informed that call is terminated
Conformance Criteria:	**Check**	
	1	TP_IMS_5107_03 in CFW step 16 (CANCEL): *ensure that {* *when { UE_A sends CANCEL to UE_B }* *then { IMS_B receives the CANCEL* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	**UE A**	**IMS A**	**IMS B**	**UE B**	**User B**		
1	→							User A calls User B
2		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6				→			INVITE	IMS_B forwards INVITE to UE_B
7				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
8					→			User B is informed of incoming call of User A
9				←			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10			←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13	→							User A cancels the call

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
14			→				CANCEL	UE_A sends a CANCEL to IMS_A
15			←				200 OK	IMS_A responds with a 200 OK to UE_A
16				→			**CANCEL**	**IMS_A forwards the CANCEL to IMS_B**
17				←			200 OK	IMS_B responds with a 200 OK to IMS_A
18					→		CANCEL	IMS_B forwards the CANCEL to UE_B
19					←		200 OK	UE_B responds with a 200 OK to IMS_B
20						→		User B is informed that call has been cancelled
21					←		487 Request Terminated	UE_B sends 487 Request Terminated to IMS_B
22					→		ACK	IMS_B responds with ACK to UE_B
23				←			487 Request Terminated	IMS_B forwards the 487 Request Terminated to IMS_A
24				→			ACK	IMS_A responds with ACK to IMS_B
25			←				487 Request Terminated	IMS_A forwards the 487 Request Terminated to UE_A
26			→				ACK	UE_A responds with ACK to IMS_A
27		←						User A is informed that call is terminated

4.5.3.1.3.2 Call CANCEL due to loss of connectivity of calling user during call

Interoperability Test Description		
Identifier:	TD_IMS_0023	
Summary:	IMS network ends call in case calling UE looses connectivity during a call	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5073_01	ES 283 003 [1], clause 5.2.8.1.2 ¶1
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • IMS_B is supporting (simulated) PDF or PCRF like functionality	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user A is informed of incoming call of User B
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user B is presented that call in process
	6	Verify that user A is informed that the call is in progress
	7	UE_B looses connectivity
	8	Verify that user A is informed that call has been ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5073_01 in CFW step 23 (BYE): *ensure that {* *when { IMS_B receives "an indication that UE_B is no_longer_available" }* *then { IMS_B sends a BYE to IMS_A* *containing Request_URI* *indicating the Contact_header_value of UE_A and* *containing To_header* *indicating the initial 200_OK_To_value from UE_A* *containing From_header* *indicating the initial INVITE_From_value from UE_B and* *containing Call-ID_header* *indicating the initial INVITE_Call_Id_value from UE_B and* *containing CSeq_header* *indicating an incremented Sequence_Number and* *containing Route_header* *indicating "dialog specific routing information for UE_A" and* *"further headers based on local policy or call release reason"* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
13	←							User A answers call
14		→					200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
15			→				200 OK	IMS_A forwards 200 OK response to IMS_B
16				→			200 OK	IMS_B forwards the 200 OK response to UE_B
17					→			User B is presented that call in process
18				←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
19			←				ACK	IMS_B forwards ACK to IMS_A
20		←					ACK	IMS_A forwards ACK to UE_A
21	←							User A is informed that the call is in progress
22								UE_B looses connectivity
23			←				**BYE**	**IMS_B forwards BYE to IMS_A**
24		←					BYE	IMS_A forwards BYE to UE_A
25	←							User A is informed that call has ended
26		→					200 OK	UE_A sends 200 OK for BYE
27			→				200 OK	IMS_A forwards 200 OK response to IMS_B

4.5.3.1.3.3 Call failure due to de-registration of calling user during call

Interoperability Test Description		
Identifier:	TD_IMS_0024	
Summary:	IMS network ends call in case calling UE is forcefully de-registered in IMS network during a call	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5139_01	ES 283 003 [1], clause 5.4.5.1.2 ¶1
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • There is an ongoing dialogue between UE_A and UE_B	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that User A is informed that call has been answered
	6	Verify that User B is informed that the call is established
	7	UE_A is forced to be de-registered in IMS_A
	8	Verify that user B is informed that call has been ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5139_01 in CFW step 23 (BYE): *ensure that {* *when { IMS_A receives a "network internal indication that the lifetime of the last public user identity has expired"}* *then { IMS_A sends a BYE to UE_B* *containing a Request_URI set to Contact_header_value of UE_B and* *containing a To_header set to* *the To_header of the 200_response to initial INVITE and* *containing a From_header set to* *the From_header of the initial INVITE and* *containing a Call-ID_header set to* *the Call-ID_header of the initial INVITE and* *containing a CSeq_header set to* *"CSeq_header from the calling user incremented by one" and* *containing a Route_header set to* *"routeing information towards the called user as stored for the dialog" and* *containing "further headers, based on local policy or the requested session release reason"* *}* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
13					←			User B answers call
14				←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
15			←				200 OK	IMS_B forwards 200 OK response to IMS_A
16		←					200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19			→				ACK	IMS_A forwards ACK to IMS_B S-CSCF
20				→			ACK	IMS_B forwards ACK to UE_B
21					→			User B is informed that the call is established
22								UE_A is forced to be de-registered in IMS_A
23			→				**BYE**	**IMS_A forwards BYE to IMS_B**
24				→			BYE	IMS_B forwards BYE to UE_B
25					→			User B is informed that call has ended
26				←			200 OK	UE_B sends 200 OK for BYE
27			←				200 OK	IMS_B forwards 200 OK response to IMS_A

4.5.3.1.3.4 Subsequent target refresh request (INVITE)

Interoperability Test Description		
Identifier:	TD_IMS_0025	
Summary:	IMS network handles subsequent INVITEs correctly in case of a user initiated call hold and resume when home caller puts another home user on hold and resumes call	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_01	ES 283 003 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_02	ES 283 003 [1], clause 5.4.3.3 ¶53
Use Case ref.:	UC_03_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using INVITE • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_01 in CFW step 25A and 40A (INVITE): *ensure that {* *when { UE_A sends a subsequent INVITE to UE_B }* *then { IMS_B receives the subsequent INVITE* *containing a Record-Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter* *and* *not containing a P-Access-Network-Info_header }* *}*
	2	TP_IMS_5121_02 (IMS_B) in CFW step 31A and 46A (200 OK): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
22A	→							User A puts call on hold
23A		→					INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
24A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
25A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
26A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
27A				→			INVITE	IMS_B forwards INVITE to UE_B
28A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
29A					→			User B is informed that call is on hold
30A					←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
31A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
32A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
33A	←							User A is informed that call is on hold
34A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
35A			→				ACK	IMS_A forwards ACK to IMS_B
36A				→			ACK	IMS_B forwards ACK to UE_B
37A	→							User A resumes call
38A		→					INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
39A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
40A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
41A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
42A				→			INVITE	IMS_B forwards INVITE to UE_B
43A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
44A					←			User B is informed that call is resumed
45A				←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
46A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
47A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
48A	←							User A is informed that call is resumed

4.5.3.1.3.5 Subsequent target refresh request (UPDATE)

Interoperability Test Description		
Identifier:	TD_IMS_0026	
Summary:	IMS network handles subsequent UPDATEs correctly in case of a user initiated call hold and resume when home caller puts another home user on hold and resumes call	
Configuration:	CF_INT_CALL	
SUT	IMS_A, IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_02	ES 283 003 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_02	ES 283 003 [1], clause 5.4.3.3 ¶53
Use Case ref.:	UC_03_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using UPDATE • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_02 (IMS_A) in CFW step 24A and 33A (UPDATE): *ensure that {* *when { UE_A sends an UPDATE to UE_B }* *then { IMS_B receives the UPDATE* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI of IMS_A and* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter* *and* *not containing a P-Access-Network-Info_header }* *}*

Interoperability Test Description		
	2	TP_IMS_5121_02 (IMS_B) in CFW step 28A and 37A (200 OK): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*

Step	Direction						Message	Comment
	User A	**UEA**	**IMSA**	**IMSB**	**UEB**	**User B**		
22A	→							User A puts call on hold
23A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
24A			→				**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
25A				→			UPDATE	IMS_B forwards UPDATE to UE_B
26A					→			User B is informed that call is on hold
27A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
28A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
29A		←					200 OK	IMS_A P-CSCF forwards the 200 OK response to UE_A
30A	←							User A is informed that call is on hold
31A	→							User A resumes call
32A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
33A			→				**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
34A				→			UPDATE	IMS_B forwards UPDATE to UE_B
35A					→			User B is informed that call is resumed
36A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
37A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
38A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
39A	←							User A is informed that call is resumed

4.5.3.1.4 Subsequent Request Procedures - Terminating Network

Interoperability Test Description		
Identifier:	TD_IMS_0027	
Summary:	IMS network ends call in case called UE looses connectivity during a call	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5074_01	ES 283 003 [1], clause 5.2.8.1.2 ¶11
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B has IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of user A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that User A is informed that call has been answered
	6	Verify that User B is informed that the call is established
	7	UE_B looses connectivity
	8	Verify that user A is informed that call has been ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5074_01 in CFW step 23 (BYE): *ensure that {* *when { IMS_B receives 'an indication that UE_B is no_longer_available' }* *then { IMS_B sends a BYE to IMS_A* *containing Request_URI* *indicating the Contact_header_value of UE_A and* *containing To_header* *indicating the initial INVITE_To_value from UE_A* *containing From_header* *indicating the initial 200_OK_From_value from UE_B and* *containing Call-ID_header* *indicating the initial INVITE_Call_Id_value from UE_A and* *containing CSeq_header* *indicating an incremented Sequence_Number and* *containing Route_header* *indicating "dialog specific routing information for UE_A" and* *"further headers based on local policy or call release reason"* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
13					←			User B answers call
14				←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
15			←				200 OK	IMS_B forwards 200 OK response to IMS_A
16		←					200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19			→				ACK	IMS_A forwards ACK to IMS_B
20				→			ACK	IMS_B forwards ACK to UE_B
21					→			User B is informed that the call is established
22								UE_B looses connectivity
23			←				**BYE**	**IMS_B sends a BYE to IMS_A**
24		←					BYE	IMS_A forwards the BYE response to UE_A
25	←							UE_A is informed that call has ended
26		→					200 OK	UE_A responds to the BYE with 200 OK
27			→				200 OK	IMS_A forwards the 200 OK response to IMS_B

4.5.3.1.5 Dialogue Procedures - Topology Hiding

4.5.3.1.5.1 Normal call

Interoperability Test Description		
Identifier:	TD_IMS_0028	
Summary:	IMS network handles basic call with topology hiding correctly	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5135_01	ES 283 003 [1], clause 5.10.4.1 ¶7
	TP_IMS_5137_01	ES 283 003 [1], clause 5.10.4.2 ¶1
	TP_IMS_5404_01	ES 283 003 [1], clause 5.10.2.2 ¶1
	TP_IMS_5408_01	ES 283 003 [1], clause 5.10.2.3 ¶1
	TP_IMS_5408_03	ES 283 003 [1], clause 5.10.2.3 ¶1
	TP_IMS_5414_01	ES 283 003 [1], clause 5.10.3.2 ¶1
	TP_IMS_5137_02	ES 283 003 [1], clause 5.10.4.2 ¶1
	TP_IMS_5137_03	ES 283 003 [1], clause 5.10.4.2 ¶1
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • IMS_A is configured for topology hiding	
Test Sequence:	**Step**	
	1	User A calls user B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers the call
	5	Verify that user A is informed that call has been answered
	6	User B is informed that the call is established
	7	User A ends the call
	8	Verify with UE_B that call has been released
	9	Verify with UE_A that call has been released
Conformance Criteria:	**Check**	
	1	TP_IMS_5135_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_B sends a initial INVITE to IMS_A }* *then { IMS_A sends the initial INVITE to IMS_B* *containing an additional topmost Record-Route_header* *indicating the IBCF_SIP_URI of IMS_A }* *}*
	2	TP_IMS_5137_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*

Interoperability Test Description		
	3	TP_IMS_5404_01 in CFW step 4 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B* *containing a P-Charging-Vector_header and* *containing a P-Charging-Function-Addresses_header }* *then { IMS_A sends the INVITE* *not containing (a P-Charging-Vector_header and* *a P-Charging-Function-Addresses_header) }* *}*
	4	TP_IMS_5408_01 in CFW step 19 (ACK): *ensure that {* *when { UE_A sends an ACK to UE_B }* *then { IMS_A sends the ACK to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*
	5	TP_IMS_5408_03 in CFW step 24A (BYE): *ensure that {* *when { UE_A sends a BYE to UE_B }* *then { IMS_A sends the BYE to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*
	6	TP_IMS_5414_01 in CFW step 5 (100 Trying): *ensure that {* *when { UE_A sends an initial INVITE to UE_B and* *IMS_A sends the INVITE to IMS_B }* *then { IMS_B sends a 100_response to IMS_A }* *}*
	7	*TP_IMS_5137_02 in CFW step 10 (180 Ringing):* *ensure that {* *when { UE_B sends a 1xx_response to UE_A }* *then { IMS_B sends the 1xx_response to IMS_A* *containing Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing Record-Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*
	8	*TP_IMS_5137_03 in CFW step 15 and 28A (200 OK):* *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_B sends the 2xx_response to IMS_A* *containing a Via_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1		→						User A calls User B
2			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3			←				100 Trying	IMS_A responds with a 100 Trying provisional response
4				→			**INVITE**	**IMS_A forwards INVITE to IMS_B**
5				←			**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
6					→		INVITE	IMS_B forwards INVITE to UE_B
7					←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
8						→		User B is informed of incoming call of User A
9					←		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
10				←			**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
11			←				180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13					←			User B answers call
14					←		200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
15				←			**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
16			←				200 OK	IMS_A forwards the 200 OK response to UE_A
17	←							User A is informed that call has been answered
18			→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
19				→			**ACK**	**IMS_A forwards ACK to IMS_B**
20					→		ACK	IMS_B forwards ACK to UE_B
21						→		User B is informed that the call is established
22A		→						User A ends call
23A			→				BYE	UE_A releases the call with BYE
24A				→			**BYE**	**IMS_A forwards BYE to IMS_B**
25A					→		BYE	IMS_B forwards BYE to UE_B
26A						→		User B is informed that call has ended
27A					←		200 OK	UE_B sends 200 OK for BYE
28A				←			**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
29A			←				200 OK	IMS_A forwards the 200 OK response to UE_A
30A	←							User A is informed that call has ended

4.5.3.1.5.2 CANCEL call by calling user

Interoperability Test Description		
Identifier:	TD_IMS_0029	
Summary:	IMS network handles calling user cancelling call correctly before its establishment with topology hiding	
Configuration:	CF_INT_CALL	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5408_02	ES 283 003 [1], clause 5.10.2.3 ¶1
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • IMS_A is configured for topology hiding	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User A cancels call
	5	Verify that user B is informed that call has been cancelled
	6	Verify that user A is informed that call is terminated
Conformance Criteria:	**Check**	
	1	TP_IMS_5408_02 in CFW step 16 (CANCEL): *ensure that {* *when { UE_A sends a CANCEL to UE_B }* *then { IMS_A sends the CANCEL to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1	→							User A calls User B
2		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6				→			INVITE	IMS_B forwards INVITE to UE_B
7				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
8					→			User B is informed of incoming call of User A
9				←			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
10			←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
11		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
12	←							User A is informed that UE_B is ringing
13	→							User A cancels the call
14		→					CANCEL	UE_A sends a CANCEL to IMS_A
15		←					200 OK	IMS_A responds with 200 OK to UE_A
16			→				**CANCEL**	**IMS_A forwards the CANCEL to IMS_B**
17			←				200 OK	IMS_B responds with 200 OK to IMS_A
18				→			CANCEL	IMS_B forwards the CANCEL to UE_B
19				←			200 OK	UE_B responds with 200 OK to IMS_B
20					→			User B is informed that call has been cancelled
21				←			487 Request Terminated	UE_B sends 487 Request Terminated to IMS_B
22				→			ACK	IMS_B responds with ACK to UE_B
23			←				487 Request Terminated	IMS_B forwards the 487 Request Terminated to IMS_A
24			→				ACK	IMS_A responds with ACK to IMS_B
25		←					487 Request Terminated	IMS_A forwards the 487 Request Terminated to UE_A
26		→					ACK	UE_A responds with ACK to IMS_A
27	←							User A is informed that call is terminated

4.5.3.1.5.3 Normal call with hold/resume

Interoperability Test Description		
Identifier:	TD_IMS_0030	
Summary:	IMS network handles user initiated call hold and resume correctly when a home caller puts a roaming user on hold and resumes call with topology hiding	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5408_04	ES 283 003 [1], clause 5.10.2.3 ¶1
Use Case ref.:	UC_03_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using INVITE • UE_A is registered in IMS_A using any user identity • UE_B is registered via IMS A in IMS_B using any user identity • IMS_A is configured for topology hiding	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed

Interoperability Test Description		
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5408_04 in CFW step 38A and 57A (INVITE): *ensure that {* *when { UE_A sends a subsequent INVITE to UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a Via_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) and* *containing a Record-Route_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) and* *containing a Route_header* *containing (encrypted_consecutive_header_entries and a tokenized-by_parameter) }* *}*

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
34			←					User B is presented that call is in progress
35A	→							User A puts call on hold
36A		→			→		INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
37A		←			←		100 Trying	IMS_A responds with a 100 Trying provisional response
38A					→		**INVITE**	**IMS_A forwards INVITE to IMS_B**
39A					←		100 Trying	IMS_B responds with a 100 Trying provisional response
40A					←		INVITE	IMS_B forwards INVITE to IMS_A
41A					→		100 Trying	IMS_A responds with a 100 Trying provisional response
42A				←			INVITE	IMS_A forwards INVITE to UE_B
43A				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
44A			←					User B is informed that call is on hold
45A				→			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
46A					→		200 OK	IMS_A forwards 200 OK response to IMS_B
47A					←		200 OK	IMS_B forwards 200 OK response to IMS_A
48A		←			←		200 OK	IMS_A forwards the 200 OK response to UE_A
49A		→			→		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
50A					→		ACK	IMS_A forwards ACK to IMS_B
51A					←		ACK	IMS_B forwards ACK to IMS_A
52A				←			ACK	IMS_A forwards ACK to UE_B
53A	←							User A is informed that call is on hold
54A	→							User A resumes call
55A		→			→		INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
56A		←			←		100 Trying	IMS_A responds with a 100 Trying provisional response
57A					→		**INVITE**	**IMS_A forwards INVITE to IMS_B**
58A					←		100 Trying	IMS_B responds with a 100 Trying provisional response

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
59A					←		INVITE	IMS_B forwards INVITE to IMS_A
60A					→		100 Trying	IMS_A responds with a 100 Trying provisional response
61A				←			INVITE	IMS_A forwards INVITE to UE_B
62A				→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
63A			←					User B is informed that call is resumed

4.5.4 Messaging

4.5.4.1 Messaging with SIP URI public identities

Interoperability Test Description		
Identifier:	TD_IMS_0031	
Summary:	IMS network handles messaging with SIP identity correctly without topology hiding	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_05	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_06	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_02	ES 283 003 [1], clause 5.4.3.3 ¶44
	TP_IMS_5118_01	ES 283 003 [1], clause 5.4.3.3 ¶45
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userSIP_priv according to table 1 • UE_B is registered in IMS_B using any user identity • IMS_A is within the trust domain of IMS_B • UE_A and UE_B registered with SIP URI public identities • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A sends message to user B
	2	Verify that user B receives message from user A
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_05 in CFW step 3 (MESSAGE) *ensure that {* *when { UE_A sends a MESSAGE to UE_B }* *then { IMS_B receives the MESSAGE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid_parameter and* *containing a orig-ioi_parameter indicating IMS_A and* *not containing a term-ioi_parameter) and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*

Interoperability Test Description		
	2	TP_IMS_5097_06 in CFW step 3 (MESSAGE) *ensure that {* *when { UE_A sends a MESSAGE to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI }* *then { IMS_B receives the MESSAGE* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI }* *}*
	3	TP_IMS_5117_02 in CFW step 7 (200 OK) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*
	4	TP_IMS_5118_01 in CFW step 7 (200 OK) *ensure that {* *when { UE_B sends 200_response to UE_A }* *then { IMS_A receives the 200_response* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B }* *}*

Step	Direction						Message	Comment
	User A	**UEA**	**IMSA**	**IMSB**	**UEB**	**User B**		
1	→							User A sends an instant message to user B
2		→					MESSAGE	UE_A sends MESSAGE to IMS_A
3			→				**MESSAGE**	**IMS_A sends MESSAGE to IMS_B**
4				→			MESSAGE	IMS_B sends MESSAGE to UE_B
5					→			User B is informed about the instant message
6				←			200 OK	UE_B sends 200 OK to IMS_B
7			←				**200 OK**	**IMS_B sends 200 OK to IMS_A**
8		←					200 OK	IMS_A sends 200 OK to UE_A
9	←							Optional: User A is presented a delivery report

4.5.4.2 Messaging with TEL URI identities

Interoperability Test Description		
Identifier:	TD_IMS_0032	
Summary:	IMS network handles messaging with TEL URI identities correctly	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_07	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_02	ES 283 003 [1], clause 5.4.3.3 ¶44
	TP_IMS_5118_01	ES 283 003 [1], clause 5.4.3.3 ¶45
	TP_IMS_5117_06	ES 283 003 [1], clause 5.4.3.3 ¶44
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userTEL_priv according to table 1 • UE_B is registered in IMS_B using userTEL_priv according to table 1 • IMS_A is within the trust domain of IMS_B	
Test Sequence:	**Step**	
	1	User A sends message to User B (i.e. userTEL in IMS_B)
	2	Verify that user B receives message from user A
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_07 in CFW step 3 (MESSAGE) *ensure that {* *when { UE_A sends a MESSAGE to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI }* *then { IMS_B receives the MESSAGE* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI }* *}*
	2	TP_IMS_5117_02 in CFW step 7 (200 OK) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter and* *not containing a P-Access-Network-Info_header }* *}*
	3	TP_IMS_5118_01 in CFW step 7 (200 OK) *ensure that {* *when { UE_B sends 200_response to UE_A }* *then { IMS_A receives the 200_response* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B }* *}*

Interoperability Test Description		
	4	TP_IMS_5117_06 in CFW step 7 (200 OK) *ensure that {* *when { UE_B sends a 2xx_response to UE_A* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI }* *then { IMS_A receives the 2xx_response* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI }* *}*

Step	**Direction**						**Message**	**Comment**
	User A	**UEA**	**IMSA**	**IMSB**	**UEB**	**User B**		
1	→							User A sends an instant message to user B
2		→					MESSAGE	UE_A sends MESSAGE to IMS_A
3			→				**MESSAGE**	**IMS_A sends MESSAGE to IMS_B**
4				→			MESSAGE	IMS_B sends MESSAGE to UE_B
5					→			User B is informed about the instant message
6				←			200 OK	UE_B sends 200 OK to IMS_B
7			←				**200 OK**	**IMS_B sends 200 OK to IMS_A**
8		←					200 OK	IMS_A sends 200 OK to UE_A
9	←							Optional: User A is presented a delivery report

4.5.4.3 Messaging with DNS/ENUM lookup procedure

Interoperability Test Description		
Identifier:	TD_IMS_0033	
Summary:	IMS network handles messaging with DNS/ENUM lookup procedure correctly	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_08	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_04	ES 283 003 [1], clause 5.4.3.3 ¶44
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using userTEL_priv according to table 1 • IMS_A is within the trust domain of IMS_B • Common DNS is configured with a DNS/ENUM entry mapping	
Test Sequence:	**Step**	
	1	User A sends message to user B's Tel URI (i.e. userTEL in IMS_B)
	2	Verify that user B receives message from user A

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_08 in CFW step 5 (MESSAGE) *ensure that {* *when { UE_A sends a MESSAGE to UE_B* *containing a Request_URI* *indicating a Tel_URI }* *then { IMS_A sends a DNS_Query to DNS* *containing the Tel_URI_E.164_Number }* *when { IMS_A receives DNS_Response* *containing a NAPTR_Resource_Record* *indicating the SIP_URI of UE_B }* *then { IMS_A sends the MESSAGE to IMS_B* *containing a Request_URI* *indicating a SIP_URI* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	2	TP_IMS_5117_04 in CFW step 9 (200 OK) *ensure that {* *when { UE_B sends a 2xx_response to UE_A* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI}* *then { IMS_A receives the 2xx_response* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI }* *}*

Step	Direction							Message	Comment
	User A	UEA	IMSA	DNS	IMSB	UEB	User B		
1	→								User A sends an instant message
2		→						MESSAGE	UE_A sends MESSAGE to IMS_A
3			→					DNS QUERY	IMS_A sends DNS QUERY to common DNS containing E.164 TEL URI
4			←					DNS RESPONSE	Common DNS sends DNS RESPONSE containing NAPTR resource record to IMS_A
5			→		→			**MESSAGE**	**IMS_A sends MESSAGE to IMS_B containing Request URI which indicates a SIP URI**
6						→		MESSAGE	IMS_B sends MESSAGE to UE_B
7							→		User B is informed about the instant message
8					←			200 OK	UE_B sends 200 OK to IMS_B
9			←		←			**200 OK**	**IMS_B sends 200 OK to IMS_A**
10		←	←					200 OK	IMS_A sends 200 OK to UE_A
11	←								Optional: User A is presented a delivery report

4.5.4.4 Messaging when roaming

Interoperability Test Description		
Identifier:	TD_IMS_0034	
Summary:	IMS network handles messaging while roaming correctly	
Configuration:	CF_ROAM_CALL	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_02	ES 283 003 [1], clause 5.4.3.3 ¶1
	TP_IMS_5118_01	ES 283 003 [1], clause 5.4.3.3 ¶45
	TP_IMS_5050_01	ES 283 003 [1], clause 5.2.6.3 ¶46
Use Case ref.:	UC_05_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A sends message to user B
	2	Verify that user B receives message from user A
Conformance Criteria:	**Check**	
	1	*TP_IMS_5108_02 in CFW step 4 (MESSAGE)* *ensure that {* *when { UE_A sends a MESSAGE to UE_B* *IMS_A sends the MESSAGE to IMS_B* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *then { IMS_B sends the MESSAGE to IMS_A* *containing no Route_header and* *indicating the S-CSCF_SIP_URI of IMS_B and* *containing a P-Charging-Vector_header* *containing the same icid_parameter and* *not containing ioi_parameters* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI of IMS_B }* *}*
	2	TP_IMS_5118_01 in CFW step 9 (200 OK) *ensure that {* *when { UE_B sends 200_response to UE_A }* *then { IMS_A receives the 200_response* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B }* *}*
	3	TP_IMS_5050_01 in CFW step 3 (MESSAGE) *ensure that {* *when { IMS_A receives a MESSAGE from UE_B }* *then { IMS_A sends the MESSAGE to IMS_B* *containing a Route_header* *indicating the "list of Service Route header URIs* *from registration" and* *not containing a P-Preferred-Identity_header and* *containing P-Asserted-Identity_header* *containing an address of UE_A and* *containing the P-Charging-Vector_header* *containing an icid_parameter }* *}*

Step	Direction						Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB		
1	→							User A sends an instant message to user B
2		→			→		MESSAGE	UE_A sends MESSAGE to IMS_A
3					→		**MESSAGE**	**IMS_A sends MESSAGE to IMS_B**
4					←		**MESSAGE**	**IMS_B sends MESSAGE to IMS_A**
5				←			MESSAGE	IMS_A sends MESSAGE to UE_B
6								User B is informed about the instant message
7				→			200 OK	UE_B sends 200 OK to IMS_A
8					→		200 OK	IMS_A sends 200 OK to IMS_B
9					←		**200 OK**	**IMS_B sends 200 OK to IMS_A**
10		←					200 OK	IMS_A sends 200 OK to UE_A
11	←							Optional: User A is presented a delivery report

4.5.4.5 Messaging with receiving user not registered

Interoperability Test Description		
Identifier:	TD_IMS_0035	
Summary:	IMS network handles messaging correctly when receiving user is not registered	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5114_02	ES 283 003 [1], clause 5.4.3.3 ¶34
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is *not* registered in IMS_B • IMS_B is *not* configured with any filter criteria to contact "any AS"	
Test Sequence:	**Step**	
	1	User A sends message to a valid user B identity
	2	Verify that user A is informed that user B could not be reached
Conformance Criteria:	**Check**	
	1	TP_IMS_5114_02 in CFW step 5 (4xx Response) *ensure that {* *when { UE_A sends a MESSAGE to UE_B and IMS_A sends the MESSAGE to IMS_B }* *then { IMS_B sends a 4xx_response to IMS_A }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1		→						User A sends an instant message to NON registered user B
2			→				MESSAGE	UE_A sends MESSAGE to IMS_A
3				→			MESSAGE	IMS_A sends MESSAGE to IMS_B
4								IMS_B detects that user B is not registered
5				←			**4xx Response**	**IMS_B sends 4xx Response to IMS_A**
6			←				4xx Response	IMS_A sends 4xx Response to UE_A
7		←						User A is informed that user B could not be reached

4.5.4.6 Messaging with receiving user barred

Interoperability Test Description		
Identifier:	TD_IMS_0036	
Summary:	IMS network handles messaging correctly when receiving user has been barred	
Configuration:	CF_INT_CALL	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_06	ES 283 003 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_05_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using any user identity • User B is barred in IMS_B	
Test Sequence:	**Step**	
	1	User A sends message to User B
	2	Verify that user A is informed that user B could not be reached
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_06 in CFW step 5 (404 Response) *ensure that {* *when { UE_A sends a MESSAGE to UE_B and* *IMS_A sends the MESSAGE to IMS_B* *containing a Request_URI* *indicating a barred_user in IMS_B }* *then { IMS_B sends 404_response to IMS_A }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	IMSB	UEB	User B		
1		→						User A sends an instant message to registered user B
2			→				MESSAGE	UE_A sends MESSAGE to IMS_A
3				→			MESSAGE	IMS_A sends MESSAGE to IMS_B
4								IMS_B detects that user B has been barred
5				←			**404 Not Found**	**IMS_B sends 404 Response to IMS_A**
6			←				404 Note Found	IMS_A sends 404 Response to UE_A
7		←						Optional: User A is informed that user B could not be reached

4.5.5 Supplementary Services

4.5.5.1 Supplementary Service HOLD with AS

Interoperability Test Description		
Identifier:	TD_IMS_0037	
Summary:	IMS network supports properly application services based on the example of the HOLD supplementary service	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5310_01	ES 283 003 [1], clause 5.4.6.1.2 ¶1
	TP_IMS_5312_01	ES 283 003 [1], clause 5.4.6.1.3 ¶1
	TP_IMS_5308_02	ES 283 003 [1], clause 5.4.4.2.2 ¶2
Use Case ref.:	UC_10_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using userHOLD identity according to table 1 • IMS_B is configured to contact AS_B (HOLD) • UE_B is subscribed to HOLD service • AS B in same trust domain as IMS B	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userHOLD in IMS_B)
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User B puts call on hold
	8	Verify that user A is informed that call on hold with AS tone
	9	Verify that user B is informed that call on hold
	10	User B resumes call
	11	Verify that user A is informed that call is resumed
	12	Verify that user B is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5310_01 in CFW step 30 and Step 32 (INVITE) *ensure that {* *when { IMS_A sends a subsequent INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing an access-network-charging-info_parameter and* *containing a P-Access-Network-Info_header* *}* *then { IMS_B sends the INVITE to AS_B* *containing a P-Charging-Vector_header* *containing an access-network-charging-info_parameter and* *containing a P-Access-Network-Info_header* *}* *}*
	3	TP_IMS_5312_01 in CFW step 41 and Step 43 (200 OK) *ensure that {* *when { IMS_B receives a 200_response from UE_B* *containing a P-Charging-Vector_header* *containing an access-network-charging-info_parameter* *}* *then { IMS_B sends the 200_response to AS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*
	4	TP_IMS_5308_02 in CFW step 70 (200 OK) *ensure that {* *when { IUT receives a 200_response from UE_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *then { IUT sends the 200_response to AS_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *}*

Step	Direction							Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB	ASB		
27			←						User B puts call on hold
28				→				INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
29				←				100 Trying	IMS_A responds with a 100 Trying provisional response
30					→			**INVITE**	**IMS_A forwards INVITE to IMS_B**
31					←			100 Trying	IMS_B responds with a 100 Trying provisional response
32						→		**INVITE**	**IMS_B sends reINVITE to AS_B**
33						←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
35						←		INVITE	AS_B sends reINVITE to IMS_B
35						→		100 Trying	IMS_B responds with a 100 Trying provisional response
36					←			INVITE	IMS_B forwards reINVITE to IMS_A
37					→			100 Trying	IMS_A responds with a 100 Trying provisional response

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
38		←						INVITE	IMS_A forwards reINVITE to UE_A
39		→			→			100 Trying	UE _A optionally responds with a 100 Trying provisional response
40	←								User A is informed that call is on hold with AS tone
41		→			→			**200 OK**	**UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"**
42					→			200 OK	IMS_A forwards 200 OK response to IMS_B
43						→		**200 OK**	**IMS_B forwards 200 OK response to AS_B**
44						←		200 OK	AS_B forwards 200 OK response to IMS_B
45					←			200 OK	IMS_B forwards 200 OK response to IMS_A
46				←				200 OK	IMS_A forward the 200 OK to UE_B
47			←						User B is informed that the call is on hold
48				→	→			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
49					→			ACK	IMS_A forwards ACK to IMS_B
50						→		ACK	IMS_B forwards ACK to AS_B
51						←		ACK	AS_B forwards ACK to IMS_B
52					←			ACK	IMS_B forwards ACK to IMS_A
53				←				ACK	IMS_A forwards ACK to UE_B
54			→						User B resumes call
55				→	→			INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
56				←				100 Trying	IMS_A responds with a 100 Trying provisional response
57					→			INVITE	IMS_A sends reINVITE to IMS_B
58					←			100 Trying	IMS_B responds with a 100 Trying provisional response
59						→		INVITE	IMS_B sends reINVITE to AS_B
60						←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
61						←		INVITE	AS_B forwards INVITE to IMS_B
62						→		100 Trying	IMS_B responds with a 100 Trying provisional response
63					←			INVITE	IMS_B sends reINVITE to IMS_A
64					→			100 Trying	IMS_A responds with a 100 Trying provisional response
65		←						INVITE	IMS_A forwards reINVITE to UE_A
66		→			→			100 Trying	UE_A optionally responds with a 100 Trying provisional response
67	←								User A is informed that call is resumed
68		→			→			200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A

Step	Direction							Message	Comment
	User A	UEA	User B	UEB	IMSA	IMSB	ASB		
69								200 OK	IMS_A forwards 200 OK response to IMS_B
70								**200 OK**	**IMS_B forwards 200 OK response to AS_B**
71								200 OK	AS_B forwards the 200 OK for INVITE
72								200 OK	IMS_B forwards 200 OK to IMS_A
73								200 OK	IMS_A forwards 200 OK to UE_B
74									User B is informed that call is resumed

4.5.5.2 Supplementary Service OIP with AS

Interoperability Test Description		
Identifier:	TD_IMS_0038	
Summary:	IMS network supports properly application services based on the example of the OIP supplementary service	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_02	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_03	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_09	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	ES 283 003 [1], clause 5.4.3.3 ¶1
	TP_IMS_5118_02	ES 283 003 [1], clause 5.4.3.3 ¶45
Use Case ref.:	UC_08_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using userOIP identity according to table 1 • IMS_B is configured to contact AS_B (OIP) • UE_B is subscribed to OIP service	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userOIP in IMS_B)
	2	Verify that user B is informed of incoming call of User A, user A's identity is displayed
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that the call is established
	7	User A ends call
	8	Verify that user B is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 4 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from UE_A addressed_to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI of UE_A }* *then { IUT sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI of UE_A }* *}*
	2	TP_IMS_5097_03 in CFW step 4 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from UE_A addressed_to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI of UE_A}* *then { IUT sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI of UE_A }* *}*
	3	TP_IMS_5097_09 in CFW step 6 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B }* *then { IUT sends the initial INVITE to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header }* *}*
	4	TP_IMS_5108_03 in CFW step 8 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_ }* *}*
	5	TP_IMS_5118_02 in CFW step 25 and 26 (200 OK) *ensure that {* *when { IUT receives 200_response from AS_B addressed_to UE_A }* *then { IUT sends the 200_response to IMS_A* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *including a term-ioi_parameter* *indicating operator_identifier of IUT_ }* *}*

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
1	→								User A calls User B
2		→	→		→			INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←			100 Trying	IMS_A responds with a 100 Trying provisional response
4					→	→		INVITE	IMS_A forwards INVITE to IMS_B
5					←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
									INVITE triggers the OIP IFC in IMS_B
6						→	→	INVITE	IMS_B forwards the INVITE to IMS_B AS
7						←	←	100 Trying	AS optionally responds with a 100 Trying provisional response
8						←	←	INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
9						→	→	100 Trying	IMS_B responds with a 100 Trying provisional response
10					←	←		INVITE	IMS_B forwards the INVITE to IMS_A
11					→	→		100 Trying	IMS_A responds with a 100 Trying provisional response
12				←	←			INVITE	IMS_A forwards the INVITE to UE_B
13				→	→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
14			←	←					User B is informed of incoming call of User A, User A's identity is displayed
15				→	→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16					→	→		180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
17						→	→	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
18						←	←	180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
19					←	←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
20		←			←			180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
21	←	←							User A is informed that UE_B is ringing
22			→	→					User B answers call
23				→	→			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
24					→	→		200 OK	IMS_A forwards 200 OK response to IMS_B
25						→	→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
26						←	←	200 OK	IMS_B AS forwards 200 OK response to IMS_B
27					←	←		200 OK	IMS_B forwards the 200 OK response to IMS_A
28		←			←			200 OK	IMS_A forwards the 200 OK response to UE_A
29	←	←							User A is informed that call has been answered

4.5.5.3 Supplementary Services OIR and ACR with AS

Interoperability Test Description		
Identifier:	TD_IMS_0039	
Summary:	IMS network supports properly application services based on the example of the OIR and ACR supplementary services	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5046_01	ES 283 003 [1], clause 5.2.6.3 ¶4
	TP_IMS_5067_01	ES 283 003 [1], clause 5.2.7.2 ¶7
	TP_IMS_5097_09	ES 283 003 [1], clause 5.4.3.2 ¶1
Use Case ref.:	UC_06_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userOIR identity according to table 1 • UE_B is registered in IMS_B via IMS_A using any userACR identity according to table 1 • IMS_A is configured to contact AS_A (OIR) • UE_A is subscribed to ACR service IMS_B is configured to contact AS_B (OIR) • UE_B is subscribed to ACR service • IMS_B is configured to contact AS_B (ACR) • UE_B is subscribed to ACR service	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userACR in IMS_B)
	2	Verify that user A is informed that call has been rejected due to ACR
Conformance Criteria:	**Check**	
	1	TP_IMS_5046_01 in CFW step 8 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing an additional Via_header* *containing (the P-CSCF_via_port_number and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *containing an additional topmost Record-Route_header* *indicating (the P-CSCF_port_number* *"where it awaits subsequent requests" from UE_A and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *indicating the "list of Service Route header URIs* *from the registration" and* *not containing P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *containing an address of UE_A and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 4 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*

Interoperability Test Description		

	3	TP_IMS_5097_09 in CFW step 10 (INVITE)
		ensure that {
		when { IUT receives an initial INVITE from IMS_A addressed_to UE_B }
		then { IUT sends the initial INVITE to AS_B
		containing a Route_header
		indicating the SIP_URI of AS_B and
		containing a P-Charging-Function-Addresses_header }
		}

	4	TP_IMS_5313_01 in CFW step 14 (433 Anonymity Disallowed) *ensure that {* *when { IUT receives a response from IMS_B* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter and* *containing a P-Access-Network-Info_header* *}* *then { IUT sends the response to AS_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter and* *containing a P-Access-Network-Info_header* *}* *}*

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1	→									User A calls User B
2		→			→				INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←				100 Trying	IMS_A responds with a 100 Trying provisional response
										INVITE triggers the OIR IFC in IMS_A
4					→				INVITE	IMS_A forwards the INVITE to IMS_A AS
5					←				100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
6					←				INVITE	IMS_A AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_A
7					→				100 Trying	IMS_A responds with a 100 Trying provisional response
8						→			INVITE	IMS_A forwards INVITE to IMS_B
9						←			100 Trying	IMS_B responds with a 100 Trying provisional response
										INVITE triggers the ACR IFC in IMS_B
10							→		INVITE	IMS_B forwards the INVITE to IMS_B AS
11							←		100 Trying	AS optionally responds with a 100 Trying provisional response
12							←		433 Anonymity Disallowed	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
13					←				433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_A
14					→				433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS
15					←				433 Anonymity Disallowed	IMS_A AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_A

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
16			←		←				433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to UE_A
17		←								User A is informed that the call has been rejected due to ACR
18			→		→				ACK	UE_A sends ACK to IMS_A
19						→			ACK	IMS_A forwards the ACK to IMS_A AS
20						←			ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
21							→		ACK	IMS_A forwards ACK to IMS_B
22								→	ACK	IMS_B forwards ACK to IMS_B AS

4.5.5.4 Supplementary Service CFU with AS

Interoperability Test Description		
Identifier:	TD_IMS_0040	
Summary:	IMS network supports properly application services based on the example of the CFU supplementary service	
Configuration:	CF_ROAM_AS	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5046_01	ES 283 003 [1], clause 5.2.6.3 ¶4
	TP_IMS_5067_01	ES 283 003 [1], clause 5.2.7.2 ¶7
	TP_IMS_5070_01	ES 283 003 [1], clause 5.2.7.3 ¶6
	TP_IMS_5110_01	ES 283 003 [1], clause 5.4.3.3 ¶33
	TP_IMS_5097_09	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	ES 283 003 [1], clause 5.4.3.3 ¶1
	TP_IMS_5118_02	ES 283 003 [1], clause 5.4.3.3 ¶45
Use Case ref.:	UC_11_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B2 have IP bearers established to IMS_B as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B2 is registered in IMS_B via IMS_A using any user identity • IMS_B is configured to contact AS_B (CFU) for userCFU • UE_B1 is subscribed to and has activated CFU service	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userCFU in IMS_B)
	2	User A may be informed of call diversion
	3	User B2 answers call
	4	Verify that user A is informed that call has been answered
	6	Verify that user B2 is informed that call is established
	7	User A ends call
	8	Verify that user B2 is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
t		
Conformance Criteria:	**Check**	
	1	TP_IMS_5046_01 in CFW step 4 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing an additional Via_header* *containing (the P-CSCF_via_port_number and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *containing an additional topmost Record-Route_header* *indicating (the P-CSCF_port_number* *'where it awaits subsequent requests' from UE_A and* *(the P-CSCF-FQDN_address or* *the P-CSCF-IP_address)) of IMS_A and* *indicating the "list of Service Route header URIs* *from the registration" and* *not containing P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *containing an address of UE_A and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 4 *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends the INVITE to IMS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*
	3	TP_IMS_5070_01 in CFW step 7 (100 Trying) *ensure that {* *when { IMS_A receives an initial INVITE from UE_B }* *then { IMS_A sends a 100_response to IMS_B* *}* *}*
	4	TP_IMS_5110_01 in CFW step 23 (200 OK) *ensure that {* *when { IUT receives a 200_response from AS_A addressed_to UE_B }* *then { IUT sends the 200_response to IMS_B }* *}*

	5	TP_IMS_5097_09 in CFW step 12 (INVITE)
		ensure that {
		when { IUT receives an initial INVITE from IMS_A addressed_to UE_B }
		then { IUT sends the initial INVITE to AS_B
		containing a Route_header
		indicating the SIP_URI of AS_B and
		containing a P-Charging-Function-Addresses_header }
		}

	6	TP_IMS_5108_03 in CFW step 6 (INVITE)
		ensure that {
		when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}
		then { IUT sends the INVITE to AS_B
		containing a topmost Route_header
		indicating the SIP_URI of AS_B and
		containing a Route_header
		indicating the S-CSCF_SIP_URI of IUT_ }
		}

Interoperability Test Description		

	7	TP_IMS_5118_02 in CFW step 22 and 23 (200 OK)
		ensure that {
		when { IUT receives 200_response from AS_B addressed_to UE_A }
		then { IUT sends the 200_response to IMS_A
		containing a P-Charging-Vector_header
		including a orig-ioi_parameter
		indicating operator_identifier of IMS_A and
		including a term-ioi_parameter
		indicating operator_identifier of IUT_ }
		}

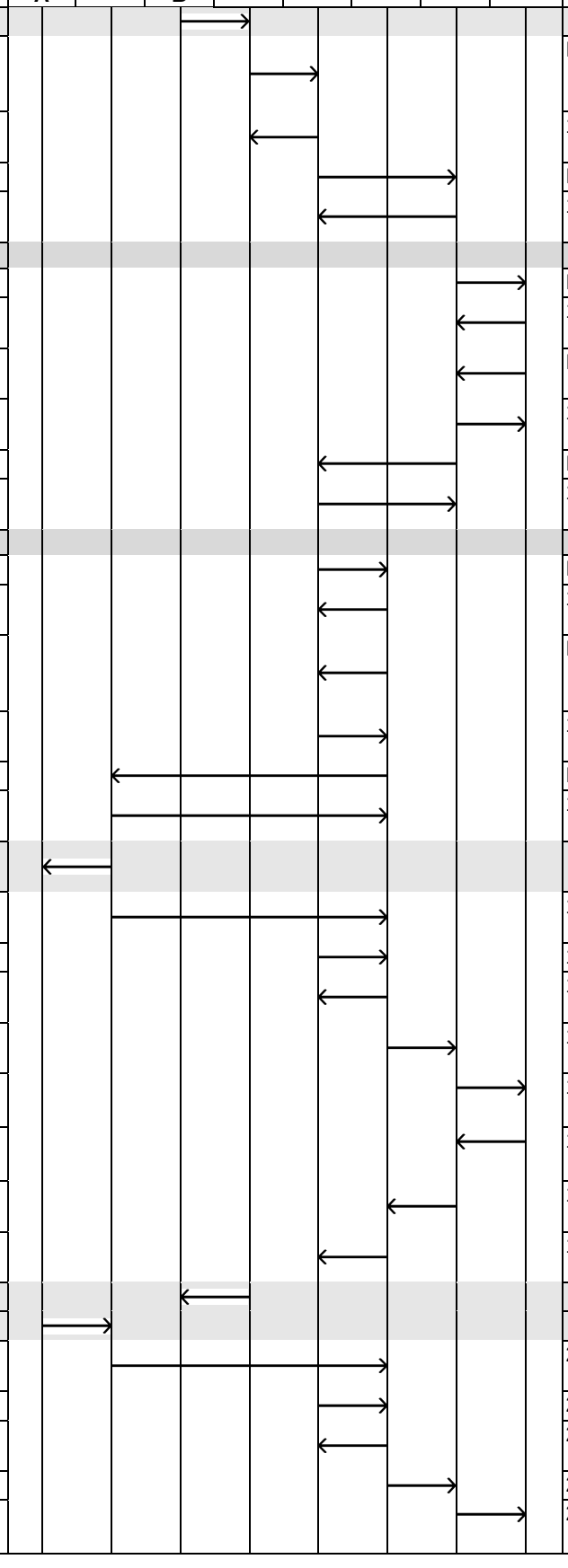
Step	Direction							Message	Comment
	User A	**UE A**	**User B2**	**UE B2**	**IMS A**	**IMS B**	**AS B**		
1	→								User A calls User B
2		→			→			INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←			100 Trying	IMS_A responds with a 100 Trying provisional response
4					→			INVITE	IMS_A forwards INVITE to IMS_B
5					←			100 Trying	IMS_B responds with a 100 Trying provisional response
									INVITE triggers the CFU IFC in IMS_B
6						→		INVITE	IMS_B forwards the INVITE to AS_B
7						←		100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
									AS_B applies the CDIV CFU procedure
8						←		181 Call is being forwarded	AS_B indicates optionally to IMS_B that call has been forwarded
9					←			181 Call is being forwarded	IMS_B indicates to IMS_A that call has been forwarded
10		←			←			181 Call is being forwarded	IMS_A indicates that call to UE_B has been forwarded
11	←								User A may be informed of call diversion
12						←		INVITE	AS_B returns modified INVITE including new request URI and history header to IMS_B
13						→		100 Trying	IMS_B responds with a 100 Trying provisional response
14					←			INVITE	IMS_B forwards the INVITE to IMS_A
15					→			100 Trying	IMS_A responds with a 100 Trying provisional response
16				←				INVITE	IMS_A forwards the INVITE to UE_B2
17				→				100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
18			←						User B2 is informed of incoming call of User A
19			→						User B2 answers call
20				→				200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
21					→			200 OK	IMS_A forwards 200 OK response to IMS_B
22						→		200 OK	IMS_B forwards 200 OK response to AS_B

Step	Direction							Message	Comment
	User A	UEA	User B2	UE B2	IMS A	IMS B	ASB		
23						←		200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
24					←			200 OK	IMS_B forwards 200 OK response to IMS_A
25		←						200 OK	IMS_A forwards 200 OK response to UE_A
26	←								User A is informed that call has been answered

4.5.5.5 Supplementary Services OIP and OIR with AS

Interoperability Test Description		
Identifier:	TD_IMS_0041	
Summary:	IMS network supports properly application services based on the example of the OIP and OIR supplementary services	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_02	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_03	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_09	ES 283 003 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	ES 283 003 [1], clause 5.4.3.3 ¶1
	TP_IMS_5118_02	ES 283 003 [1], clause 5.4.3.3 ¶45
Use Case ref.:	UC_09_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userOIP_priv identity according to table 1 • UE_B is registered in IMS_B via IMS_A using userOIR_priv identity according to table 1 • IMS_A is configured to contact AS_B (OIP) • UE_A is subscribed to OIP service • IMS_B is configured to contact AS_A (OIR) • UE_B is subscribed to OIR service	
Test Sequence:	**Step**	
	1	User B calls User A (i.e. userOIR in IMS_A)
	2	Verify that user A is informed of incoming call of User B and User B's identity is not displayed
	3	Verify that user B is informed that UE_A is ringing
	4	User A answers call
	5	Verify that user B is informed that call has been answered
	6	Verify that user A is informed that the call is established
	7	User A ends call
	8	Verify that user B is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 4 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from UE_A addressed_to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *not indicating a Tel_URI of UE_A }* *then { IUT sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_URI of UE_A }* *}*
	2	TP_IMS_5097_03 in CFW step 4 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from UE_A addressed_to UE_B* *not containing a P-Preferred-Identity_header or* *containing a P-Preferred-Identity_header* *indicating a Tel_URI of UE_A}* *then { IUT sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the default_registered_public_identity of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating a Tel_derived_SIP_URI of UE_A }* *}*
	3	TP_IMS_5097_09 in CFW step 6 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B }* *then { IUT sends the initial INVITE to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header }* *}*
	4	TP_IMS_5108_03 in CFW step 8 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_ }* *}*
	5	TP_IMS_5118_02 in CFW step 35 (200 OK) *ensure that {* *when { IUT receives 200_response from AS_B addressed_to UE_A }* *then { IUT sends the 200_response to IMS_A* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *including a term-ioi_parameter* *indicating operator_identifier of IUT_ }* *}*



Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1										User B calls User A
2									INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3									100 Trying	IMS_A responds with a 100 Trying provisional response
4									INVITE	IMS_A forwards INVITE to IMS_B
5									100 Trying	IMS_B responds with a 100 Trying provisional response
										INVITE triggers the OIR IFC in IMS_B
6									INVITE	IMS_B forwards the INVITE to IMS_B AS
7									100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
8									INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
9									100 Trying	IMS_B responds with a 100 Trying provisional response
10									INVITE	IMS_B forwards the INVITE to IMS_A
11									100 Trying	IMS_A responds with a 100 Trying provisional response
										INVITE triggers the OIP IFC in IMS_A
12									INVITE	IMS_A forwards the INVITE to IMS_A AS
13									100 Trying	IMS A AS optionally responds with a 100 Trying provisional response
14									INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
15									100 Trying	IMS_A responds with a 100 Trying provisional response
16									INVITE	IMS_A forwards the INVITE to UE_A
17									100 Trying	UE_A optionally responds with a 100 Trying provisional response
18										User A is informed of incoming call of User B, user B's identity is not displayed
19									180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20									180 Ringing	IMS_A forwards the 180 Ringing to IMS_A AS
21									180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
22									180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
23									180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
24									180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
25									180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
26									180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
27										User B is informed that UE_A is ringing
28										User A answers call
29									200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
30									200 OK	IMS_A forwards the 200 OK to IMS_A AS
31									200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
32									200 OK	IMS_A forwards 200 OK response to IMS_B
33									200 OK	IMS_B forwards 200 OK response to IMS_B AS

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
34							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
35						←			200 OK	IMS_B forwards the 200 OK response to IMS_A
36					←				200 OK	IMS_A forwards the 200 OK response to UE_B
37			←							User B is informed that call has been answered

History

Document history		
V1.1.1	February 2009	Publication
V2.2.1	March 2009	Publication