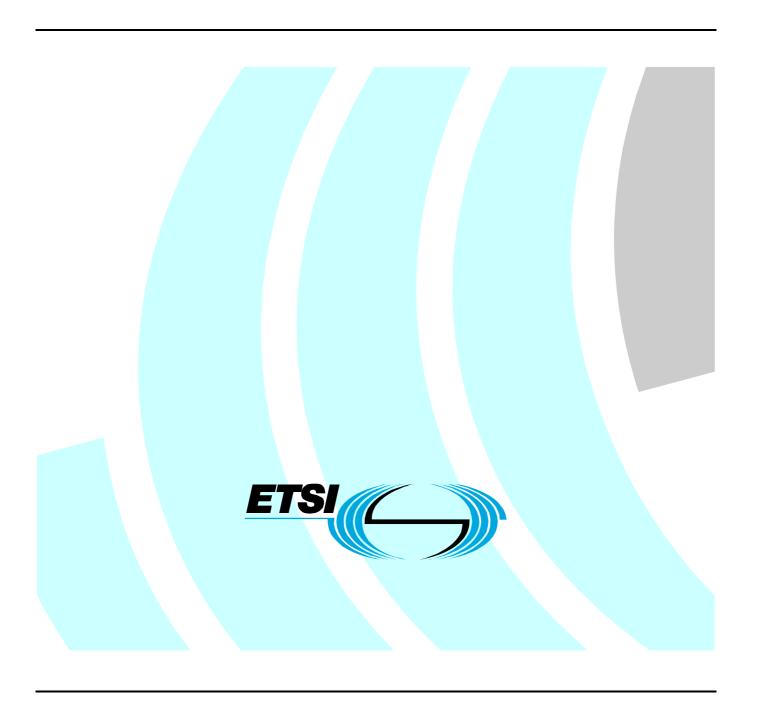# ETSI TS 186 011-2 V2.3.1 (2010-04)

Technical Specification

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

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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 Interoperability";

Part 2:   "Test descriptions for IMS NNI Interoperability";

Part 3:   "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (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, TS 124 229 [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 TS 124 229 [1]. TDs have been only specified for requirements that are observable at the interface between two IMS core network implementations, i.e. IMS NNI.

> NOTE: Requirements pertaining to a UE or an AS implementation or IMS core network requirements that can only be observed at the interface between UE and IMS CN are explicitly not within the scope of the present document. The latter requirements have been dealt with from a UE and conformance perspective in TS 134 229 [6].

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 TS 124 229: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 version 7.14.0 Release 7)".

[2] ETSI TS 186 011-1 (V2.0.0): "Technical Committee for IMS Network Testing (INT); IMS NNI Interoperability Test Specifications; Part 1: Test purposes for IMS NNI Interoperability".

[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 (all parts): "Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)".

[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)".

[14]   ETSI TS 183 063: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based IPTV stage 3 specification".

[15]   ETSI TS 124 141: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Presence service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3 (3GPP TS 24.141 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
BC	Broadcast
CB	Call Barring
CDIV	Call DIVersion
CF	(Test) ConFiguration
CFU	Call Forward Unconditional
CFW	Call FloW
CN	Core Network
CoD	Content on Demand
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
IPTV	IP Television
ISC	IMS Service Control
MGCF	Media Gateway Control Function
MGF	Media Gateway Function
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
NNI	Network-to-Network Interface
N-PVR	Network based Personal Video Recording
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
SGF	Signalling Gateway Function
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 UE	Direction IMS	Message	Comment	
1				The UE establishes an IP bearer as required by its specific access network (optional).	
2	←→			P-CSCF address discovery using DHCP procedures for IPv4 (optional).	
3	→		REGISTER	The UE sends initial registration for IMS services.	
4	←		200 OK	The IMS responds with 200 OK.	
5	→		SUBSCRIBE	The UE subscribes to its registration event package.	Unprotected
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
userPRES_priv	userPRES	na	1	contact Presence AS
userIPTV_priv	userIPTV	na	1	Contact IPTV 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.

4.3.1.6 MRFC

4.3.1.6.1 Relevant Interfaces

4.3.1.6.2 Node Configuration

The MRFC should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the MRFC 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 MRFC is not activated.

4.3.1.7 MRFP

4.3.1.7.1 Relevant Interfaces

4.3.1.7.2 Node Configuration

The MRFP should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the MRFP 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 MRFP is not activated.

4.3.1.8 MGCF

4.3.1.8.1 Relevant Interfaces

4.3.1.8.2 Node Configuration

The MGCF should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the MGCF 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 MGCF is not activated.

4.3.1.9 MGF

4.3.1.9.1 Relevant Interfaces

4.3.1.9.2 Node Configuration

The MGF should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the MGF 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 MGF is not activated.

4.3.1.10 SGF

4.3.1.10.1 Relevant Interfaces

4.3.1.10.2 Node Configuration

The MGCF should be configured to support the pre-requisites outlined in clause 4.2. The need to activate the SGF 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 SGF is not activated.

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: 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, AS may be involved, 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, ASes for UE_A and UE_B (AS), IBCF may be involved
Test configuration for:
    Requests and responses between ASes 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

Roaming Application Server

CF_ROAM_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

CF_INT_CONF_CALL

Precondition:
    Different network operators performing origination and termination, both UEs or only UE A in home
    networks (INT), both UE's registered, CONF AS is involved in IMS A, IMS A and IMS B both include
    MRFC and MRFP
Test configuration for:
    Requests and responses between UE_A and UE_B in an Ad-Hoc Conference Call (CONF_CALL)
Example:
    Initial INVITE in from UE_A to initiate an Ad-Hoc Conference call in IMS A, and subsequent invitation
    to UE_B to join (via REFER method from UE_A)

Figure 6: CF_INT_CONF_CALL

IPTV

CF_IPTV

Precondition:
    UE A registered in home network, IPTV-AS is involved
Test configuration for:
    Requests and responses between UE_A and AS_A
Example:
    Initial INVITE from UE_A to AS_A to initiate a IPTV Broadcast session.

Figure 7: CF_IPTV

IMS-PSTN Call

CF_PSTN

Precondition:
    Single network with UE in home networks and registered, AS and I-CSCF may be involved
Test configuration for:
    Requests and responses between UE and POTS or ISDN phone
Example:
     Initial INVITE from UE to POTS phone

Figure 8: CF_PSTN

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			→					User B triggers registration to 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

Step	Direction					Message	Comment
			User B	UE B	IMS A	IMS B		
16					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
17				←			200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_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

4.4.2 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
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
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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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
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

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 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
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

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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
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

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Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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
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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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
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)
290B							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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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
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	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_AW 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 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)

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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
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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
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
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)

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B		
39B					→→		UPDATE	IMS_A forwards UPDATE to IMS_B
40B					←←		UPDATE	IMS_B forwards UPDATE to IMS_A
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. 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_INT_AS when UE_B is in home network and to CF_ROAM_AS when UE_B is roaming in IMS_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_INT_AS
1	User A calls User B	Step 1
2	User A is informed that call has been rejected due to ACR	Step 17

Step	Action	CF_ROAM_AS
1	User B calls User A	Step 1
2	User B is informed that call has been rejected due to ACR	Step 20

4.4.5.2   UC_06_I: SIP message flow for SS ACR with CF_INT_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

4.4.5.3 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 B calls User A
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 sends INVITE to IMS_B
5					←				100 Trying	IMS_B responds with a 100 Trying provisional response
							INVITE triggers the OIR IFC in IMS_A			
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 INVITE to IMS_A
11							→		100 Trying	IMS_A responds with a 100 Trying provisional response
							INVITE triggers the ACR IFC in IMS_B			
12						→			INVITE	IMS_A forwards the INVITE to IMS_A AS
13					←				100 Trying	AS optionally responds with a 100 Trying provisional response
14					←				433 Anonymity Disallowed	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
15					→	→			433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to IMS_B
16							→		433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_B AS
17							←		433 Anonymity Disallowed	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
18					←				433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_A
19				←					433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to UE_B
20	←									User B is informed that the call has been rejected due to ACR
21				→					ACK	UE_B sends ACK to IMS_A
22					→	→			ACK	IMS_A sends ACK to IMS_B
23							→		ACK	IMS_B forwards the ACK to IMS_B AS
24							←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
25					←				ACK	IMS_B forwards ACK to IMS_A
26						→			ACK	IMS_A forwards ACK to IMS_A AS

4.4.6 Supplementary Service Outgoing Communication Barring (OCB)

4.4.6.1 Description

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_INT_AS when UE_B is in home network and to CF_ROAM_AS when UE_B is roaming in IMS_A.

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_AS	CF_ROAM_AS
1	User B calls User A	Step 1	Step 1
2	User B is informed that call was declined	Step 8	Step 11

4.4.6.2 UC_07_I: SIP message flow for SS OCB with CF_INT_AS

The expected call flow sequence is:

Step	User A	UE A	User B	UE B	IMS A	IMS B	AS B	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_B responds with a 100 Trying provisional response
									INVITE triggers the OCB IFC in IMS_B
4								INVITE	IMS_B forwards the INVITE to IMS_B AS
5								100 Trying	AS optionally responds with a 100 Trying provisional response
6								603 Decline	IMS_B AS returns 603 Decline to IMS_B
7								603 Decline	IMS_B forwards the 603 Decline to UE_B
8									User B is informed that call was declined
9								ACK	UE_B sends ACK to IMS_B
10								ACK	IMS_B forwards ACK to IMS_B AS

4.4.6.3 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	A S 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. UE_B is subscribed to OIP service. The call flow path and node configuration for this use case corresponds to CF_INT_AS when UE_B is in home network and to CF_ROAM_AS when UE_B is roaming in IMS_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_INT_AS	CF_ROAM_AS
1	User A calls User B	Step 1	Step 1
2	User B is informed of incoming call of User A, user A's identity is displayed	Step 12	Step 14
3	User A is informed that UE_B is ringing	Step 18	Step 21
4	User B answers call	Step 19	Step 22
5	User A is informed that call has been answered	Step 25	Step 29
6	User B is informed that the call is established	Step 31	Step 36
7	User A ends call	Step 32	Step 37
8	User B is informed that call has ended	Step 38	Step 44
9	User A is informed that call has ended	Step 44	Step 51

4.4.7.2 UC_08_I: SIP message flow for SS OIP with CF_INT_AS

The expected call flow sequence is:

Step	Direction (User A, UE A, User B, UE B, IMS A, IMS B, AS B)	Message	Comment
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 → UE B	INVITE	IMS_B forwards the INVITE to UE_B
11	UE B → IMS B	100 Trying	UE_B optionally responds with a 100 Trying provisional response
12	UE B → User B		User B is informed of incoming call of User A, User A's identity is displayed
13	UE B → IMS B	180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
14	IMS B → AS B	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
15	AS B → IMS B	180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
16	IMS B → IMS A	180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
17	IMS A → UE A	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
18	UE A → User A		User A is informed that UE_B is ringing
19	User B → UE B		User B answers call
20	UE B → IMS B	200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
21	IMS B → AS B	200 OK	IMS_B forwards 200 OK response to IMS_B AS
22	AS B → IMS B	200 OK	IMS_B AS forwards 200 OK response to IMS_B
23	IMS B → IMS A	200 OK	IMS_B forwards the 200 OK response to IMS_A
24	IMS A → UE A	200 OK	IMS_A forwards the 200 OK response to UE_A
25	UE A → User A		User A is informed that call has been answered
26	UE A → IMS A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27	IMS A → IMS B	ACK	IMS_A forwards ACK to IMS_B
28	IMS B → AS B	ACK	IMS_B forwards ACK to IMS_B AS
29	AS B → IMS B	ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
30	IMS B → UE B	ACK	IMS_B forwards ACK to UE_B
31	UE B → User B		User B is informed that the call is established
32	User A → UE A		User A ends call
33	UE A → IMS A	BYE	UE_A releases the call with BYE
34	IMS A → IMS B	BYE	IMS_A forwards BYE to IMS_B

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
35						→		BYE	IMS_B forwards BYE to IMS_B AS
36						←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
37				←				BYE	IMS_A forwards BYE to UE_B
38			←						User B is informed that call has ended
39				→				200 OK	UE_B sends 200 OK for BYE
40						→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
41						←		200 OK	IMS_B AS forwards 200 OK response to IMS_B
42					←			200 OK	IMS_B forwards the 200 OK response to IMS_A
43		←						200 OK	IMS_A forwards the 200 OK response to UE_A
44	←								User A is informed that call has ended

4.4.7.3   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 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

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS 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
30				→				ACK	UE_A acknowledges the receipt of 200 OK for INVITE
31					→			ACK	IMS_A forwards ACK to IMS_B
32						→		ACK	IMS_B forwards ACK to IMS_B AS
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

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_INT_AS when UE_B is in home network and to CF_ROAM_AS when UE_B is roaming in IMS_A.
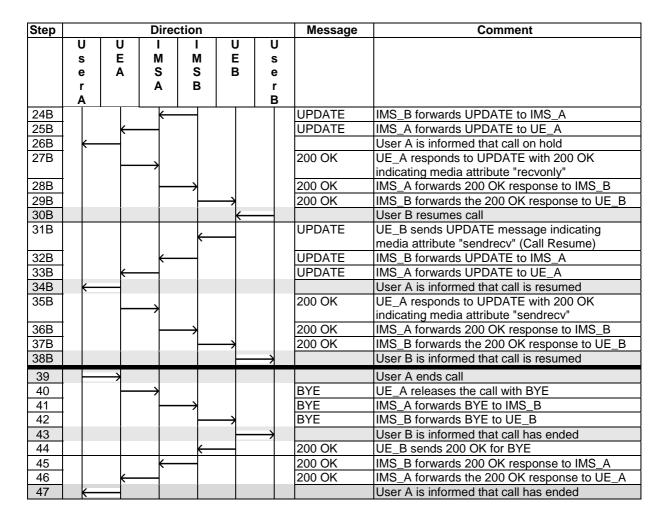
The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering).

Step	Action	CF_INT_AS	CF_ROAM_AS
1	User B calls User A	Step 1	Step 1
2	User A is informed of incoming call of User B, user B's identity is not displayed	Step 17	Step 18
3	User B is informed that UE_A is ringing	Step 25	Step 27
4	User A answers call	Step 26	Step 28
5	User B is informed that call has been answered	Step 34	Step 37
6	User A is informed that the call is established	Step 42	Step 46
7	User A ends call	Step 43	Step 47
8	User B is informed that call has ended	Step 51	Step 56
9	User A is informed that call has ended	Step 59	Step 65

4.4.8.2   UC_09_I: SIP message flow for SS OIR with CF_INT_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 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_B responds with a 100 Trying provisional response
										INVITE triggers the OIR IFC in IMS_B
4							→		INVITE	IMS_B forwards the INVITE to IMS_B AS
5							←		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
6							←		INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
7							→		100 Trying	IMS_B responds with a 100 Trying provisional response
8						←			INVITE	IMS_B forwards the INVITE to IMS_A
9						→			100 Trying	IMS_A responds with a 100 Trying provisional response
										INVITE triggers the OIP IFC in IMS_A
10						→			INVITE	IMS_A forwards the INVITE to IMS_A AS
11						←			100 Trying	IMS A AS optionally responds with a 100 Trying provisional response
12						←			INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
13						→			100 Trying	IMS_A responds with a 100 Trying provisional response
14			←						INVITE	IMS_A forwards the INVITE to UE_A
15			→						100 Trying	UE_A optionally responds with a 100 Trying provisional response
17	←									User A is informed of incoming call of User B, user B's identity is not displayed
18			→						180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
19					→				180 Ringing	IMS_A forwards the 180 Ringing to IMS_A AS
20					←				180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
21						→			180 Ringing	IMS_A forwards 180 Ringing response to IMS_B
22							→		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
23								←	180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
24				←					180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
25			←							User B is informed that UE_A is ringing
26	→									User A answers call
27						→			200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
28					→				200 OK	IMS_A forwards the 200 OK to IMS_A AS
29					←				200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
30						→			200 OK	IMS_A forwards 200 OK response to IMS_B
31							→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
32							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
33				←					200 OK	IMS_B forwards the 200 OK response to UE_B
34			←							User B is informed that call has been answered
35				→					ACK	UE_B acknowledges the receipt of 200 OK for INVITE
36							→		ACK	IMS_B forwards ACK to IMS_B AS
37							←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
38					←				ACK	IMS_B forwards ACK to IMS_A
39					→				ACK	IMS_A forwards the ACK to IMS_A AS
40					←				ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
41		←							ACK	IMS_A forwards ACK to UE_A
42	←									User A is informed that the call is established
43	→									User A ends call
44					→				BYE	UE_A releases the call with BYE
45					→				BYE	IMS_A forwards BYE to IMS_A AS
46					←				BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
47						→			BYE	IMS_A forwards BYE to IMS_B
48							→		BYE	IMS_B forwards BYE to IMS_B AS
49							←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
50				←					BYE	IMS_A forwards BYE to UE_B
51			←							User B is informed that call has ended
52				→					200 OK	UE_B sends 200 OK for BYE
53							→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
54							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
55						←			200 OK	IMS_B forwards the 200 OK response to IMS_A
56					→				200 OK	IMS_A forwards the 200 OK to IMS_A AS
57					←				200 OK	IMS_A AS forwards, possibly modified, 200 OK 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

4.4.8.3 UC_09_R: SIP message flow for SS OIR 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 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	ASA	IMS B	ASB		
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
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
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_A AS
50									BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
51									BYE	IMS_A forwards BYE to IMS_B
52									BYE	IMS_B forwards BYE to IMS_B AS
53									BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
54									BYE	IMS_B forwards 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
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).
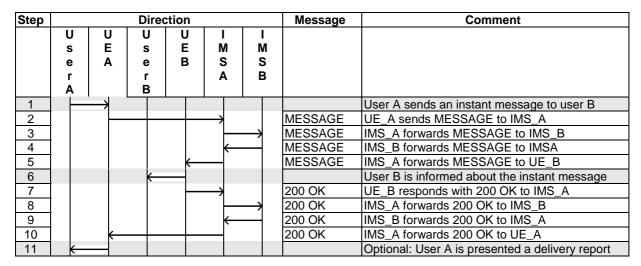
Step	Action	CF_INT_AS	CF_ROAM_AS
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	8	10
3	User A is informed that UE_B is ringing	12	15
4	User B answers call	13	16
5	User A is informed that call has been answered	17	21
6	User B is informed that call is established	21	26
7	User B puts call on hold	22	27
8	User A is informed that call on hold with AS tone	33	40
9	User B is informed that call on hold	39	47
10	User B resumes call	45	54
11	User B is informed that call is resumed	61	73
12	User A is informed that call is resumed	67	80
13	User A ends call	68	81
14	User B is informed that call has ended	72	86
15	User A is informed that call has ended	76	91

4.4.9.1.1   UC_10_I: SIP Call Flow "call hold and resume with AS tone" using reINVITE with CF_INT_AS

The expected call flow sequence is:

Step	Direction							Message	Comment
	U s e r A	U E A	U s e r B	U E B	I M S A	I M S B	A S 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_A 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 the 180 Ringing response to IMS_A
11								180 Ringing	IMS_A P- forwards the 180 Ringing response to UE_A

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

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
43								ACK	IMS_B forwards ACK to IMS_A
44								ACK	IMS_A forwards ACK to UE_A
45									User B resumes call
46								INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
47								100 Trying	IMS_B responds with a 100 Trying provisional response
48								INVITE	IMS_B sends reINVITE to AS_B
49								100 Trying	AS_B optionally responds with a 100 Trying provisional response
50								INVITE	AS_B forwards INVITE to IMS_B
51								100 Trying	IMS_B responds with a 100 Trying provisional response
52								INVITE	IMS_B sends reINVITE to IMS_A
53								100 Trying	IMS_A responds with a 100 Trying provisional response
54								INVITE	IMS_A forwards reINVITE to UE_A
55								100 Trying	UE_A optionally responds with a 100 Trying provisional response
56								200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
57								200 OK	IMS_A forwards 200 OK response to IMS_B
58								200 OK	IMS_B forwards 200 OK response to AS_B
59								200 OK	AS_B forwards the 200 OK for INVITE
60								200 OK	IMS_B forwards 200 OK to UE_B
61									User B is informed that call is resumed
62								ACK	UE_B sends ACK to IMS_B
63								ACK	IMS_B forwards ACK to AS_B
64								ACK	AS_B forwards ACK to IMS_B
65								ACK	IMS_B forwards ACK to IMS_A
66								ACK	IMS_A forwards ACK to UE_A
67								ACK	User A is informed that call resumed
68									User A ends call
69								BYE	UE_A releases the call with BYE
70								BYE	IMS_A forwards BYE to IMS_B
71								BYE	IMS_B forwards BYE to UE_B
72									User B is informed that call has ended
73								200 OK	UE_B sends 200 OK for BYE

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
74								200 OK	IMS_B forwards 200 OK response to IMS_A
75								200 OK	IMS_A forwards the 200 OK response to UE_A
76									User A is informed that call has ended

4.4.9.1.2 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
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	AS 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 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
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

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Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS 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								200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
68								200 OK	IMS_A forwards 200 OK response to IMS_B
69								200 OK	IMS_B forwards 200 OK response to AS_B
70								200 OK	AS_B forwards the 200 OK for INVITE
71								200 OK	IMS_B forwards 200 OK to IMS_A
72								200 OK	IMS_A forwards 200 OK to UE_B
73									User B is informed that call is resumed
74								ACK	UE_B sends ACK to IMS_A
75								ACK	IMS_A forwards ACK to IMS_B
76								ACK	IMS_B forwards ACK to AS_B
77								ACK	AS_B forwards ACK to IMS_B
78								ACK	IMS_B forwards ACK to IMS_A
79								ACK	IMS_A forwards ACK to UE_A
80								ACK	User A is informed that call resumed
81									User A ends call
82								BYE	UE_A releases the call with BYE

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
83						→		BYE	IMS_A forwards BYE to IMS_B
84					←			BYE	IMS_B forwards BYE to IMS_A
85				←				BYE	IMS_A 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_INT_AS	CF_ROAM_AS
1	User A calls User B	1	1
2	User A may be informed of call diversion	11	11
3	User B2 is informed of incoming call of User A	16	18
4	User B2 answers call	17	19
5	User A is informed that call has been answered	23	26
6	User B2 is informed that call is established	29	32
7	User A ends call	30	33
8	User B2 is informed that call has ended	34	37
9	User A is informed that call has ended	38	42

4.4.10.1.1 UC_11_I: SIP Call Flow "Communication Forwarding unconditional" with CF_INT_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	→								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

Step	Direction							Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IMS B	AS B		
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 UE_B2
15								100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
16									User B2 is informed of incoming call of User A
17									User B2 answers call
18								200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
19								200 OK	IMS_B forwards 200 OK response to AS_B
20								200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
21								200 OK	IMS_B forwards 200 OK response to IMS_A
22								200 OK	IMS_A forwards 200 OK response to UE_A
23									User A is informed that call has been answered
24								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
25								ACK	IMS_A forwards ACK to IMS_B
26								ACK	IMS_B forwards ACK to AS_B
27								ACK	AS_B returns, possibly modified, ACK to IMS_B
28								ACK	IMS_B forwards ACK to UE_B2
29									User B2 is informed that call is established
30									User A ends call
31								BYE	UE_A releases the call with BYE
32								BYE	IMS_A forwards BYE to IMS_B
33								BYE	IMS_B forwards BYE to UE_B
34									User B is informed that call has ended
35								200 OK	UE_B sends 200 OK for BYE

Step	Direction							Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IMS B	AS B		
36						←		200 OK	IMS_B forwards 200 OK response to IMS_A
37		←						200 OK	IMS_A forwards the 200 OK response to UE_A
38	←								User A is informed that call has ended

4.4.10.1.2 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	→								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

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 IMS_A
32								ACK	IMS_B forwards ACK to UE_B2
33									User B2 is informed that call is established
34									User A ends call
35								BYE	UE_A releases the call with BYE
36								BYE	IMS_A forwards BYE to IMS_B
37								BYE	IMS_B forwards BYE to IMS_A
38								BYE	IMS_A forwards BYE to UE_B
39									User B is informed that call has ended
40								200 OK	UE_B sends 200 OK for BYE
41								200 OK	IMS_A forwards 200 OK response to IMS_B
42								200 OK	IMS_B forwards 200 OK response to IMS_A
43								200 OK	IMS_A forwards the 200 OK response to UE_A
44									User A is informed that call has ended

4.4.10.1.3 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
21							CANCEL	IMS_B sends CANCEL request to UE_B1

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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.

4.4.11 Addition of media stream

4.4.11.1 Description

UE_A and UE_B are in an established session with one or more media streams. While in the established session, UE_A adds a new media stream. It is assumed that both UEs are registered in their respective networks.

The test sequence and expected call flow sequence for addition of multimedia stream can be illustrated when adding a new media stream, for example, adding a chat/text session during an existing IMS VoIP call.

Step	Action	CF_INT_CALL
1	User A calls User B	1
2	User B is informed of incoming call of User A	8
3	User A is informed that UE_B is ringing	12
4	User B answers call	13
5	User A is informed that call has been answered	17
6	User B is presented that call is established	21
7A	User A adds a new media stream	22A
7B	User B adds a new media stream	22B
8A	User B may be informed to accept/reject new media stream	29A
8B	User A may be informed to accept/reject new media stream	29B
9A	User A may be informed that UE_B is alerting User B	33A
9B	User B may be informed that UE_A is alerting User A	33B
10A	If informed, User B accepts the new media stream	34A
10B	If informed, User A accepts the new media stream	34B
11A	User A is informed that new media stream has been accepted	38A
11B	User B is informed that new media stream has been accepted	38B
12	User A ends call	42
13	User B is informed that call has ended	46
14	User A is informed that call has ended	50

NOTE: The call flow sequences described in this section are not limited to multimedia stream handling scenarios where remote user interaction is required. In other words these call flow sequences may be observed for a call scenario where remote user interaction is not invoked. For example, these same call flows may apply to a scenario where a user removes the video stream from a multimedia audio+video session (remote user interaction is highly unlikely in this case but the same call flows illustrated in this section may be observed nevertheless).

4.4.11.1.1 UC_13: SIP Call Flow "Addition of media stream using reINVITE"

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 the INVITE to IMS_B
5			←				100 Trying	IMS_B responds with a 100 Trying provisional response
6				→			INVITE	IMS_B forwards the 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
10			←				180 Ringing	IMS_B forwards the 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 with 200 OK to INVITE
15			←				200 OK	IMS_B forwards the 200 OK response to IMS_A

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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 the ACK to IMS_B
20				→			ACK	IMS_B forwards the ACK to UE_B
21					→			User B is presented that call is established
22A	→							User A adds a new media stream
23A		→					INVITE	UE_A sends reINVITE message with new media stream in SDP
24A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
25A			→				INVITE	IMS_A forwards the INVITE to IMS_B
26A			←				100 Trying	IMS_B responds with a 100 Trying provisional response
27A				→			INVITE	IMS_B forwards the INVITE to UE_B
28A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
29A					→			User B may be informed to accept/reject new media stream
30A				←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
31A			←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
32A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
33A	←							User A may be informed that UE_B is alerting User B
34A					←			If informed, User B accepts the new media stream
35A				←			200 OK	UE_B responds with 200 OK to reINVITE
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 new media stream has been accepted
39A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
40A			→				ACK	IMS_A forwards the ACK to IMS_B
41A				→			ACK	IMS_B forwards the ACK to UE_B
22B					←			User B adds a new media stream
23B				←			INVITE	UE_B sends reINVITE message with new media stream in SDP
24B				→			100 Trying	IMS_B responds with a 100 Trying provisional response
25B			←				INVITE	IMS_B forwards the reINVITE to IMS_A
26B			→				100 Trying	IMS_A responds with a 100 Trying provisional response
27B		←					INVITE	IMS_A forwards the reINVITE to UE_A
28B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
29B	←							User A may be informed to accept/reject new media stream
30B		→					180 Ringing	UE_A responds to reINVITE with 180 Ringing
31B			→				180 Ringing	IMS_A forwards the 180 Ringing response to IMS_B
32B				→			180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
33B					→			User B may be informed that UE_A is alerting User A
34B		→						If informed, User A accepts the new media stream

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
35B			→				200 OK	UE_A responds with 200 OK to reINVITE
36B				→			200 OK	IMS_A forwards the 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 new media stream has been accepted
39B					←		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
40B				←			ACK	IMS_B forwards the ACK to IMS_A
41B			←				ACK	IMS_A forwards the ACK to UE_A
42		→						User A releases the call
43			→				BYE	UE_A sends BYE to IMS_A
44				→			BYE	IMS_A forwards the BYE to IMS_B
45					→		BYE	IMS_B forwards the BYE to UE_B
46						→		User B is informed that call has ended
47					←		200 OK	UE_B sends 200 OK for BYE
48				←			200 OK	IMS_B forwards 200 OK response to IMS_A
49			←				200 OK	IMS_A forwards the 200 OK response to UE_A
50	←							User A is informed that call has ended

4.4.12   Removal of media stream

4.4.12.1   Description

UE_A and UE_B are in an established session with multiple media streams. While in the established session, UE_A removes a media stream. It is assumed that both UEs are registered in their respective networks.

The test sequence and expected call flow sequence for multimedia session handling (when remote user interaction shall be avoided) can be illustrated when removing a media stream from a multimedia session with multiple streams (e.g. remove the chat/text stream from an IMS VoIP + chat multi-stream session).

Step	Action	CF_INT_CALL Using UPDATE	CF_INT_CALL Using reINVITE
1	User A initiates a multimedia session with at least two streams with User B	1	1
2A	User A removes one of the media streams	42A	42A
2B	User B removes one of the media streams	42B	42B
3A	User B is informed that the media stream has been removed	46A	49A
3B	User A is informed that the media stream has been removed	46B	49B
4	User A releases the call	50	56
5	User B is informed that call has ended	54	60
6	User A is informed that call has ended	58	64

NOTE: The call flow sequences described in this section depict multimedia streaming handling scenarios where remote user interaction is not invoked. For example, remote user interaction is highly unlikely in an IMS VoIP audio session where a user decides to switch to some other audio codec.

4.4.12.1.1   UC_14: SIP Call Flow "Removal of media streams using UPDATE"

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
1								User A initiates a multimedia session with at least two streams with User B
42A								User A removes one of the media streams
43A							UPDATE	UE_A sends UPDATE to IMS_A
44A							UPDATE	IMS_A forwards the UPDATE to IMS_B
45A							UPDATE	IMS_B forwards the UPDATE to UE_B
46A								User B is informed that the media stream has been removed
47A							200 OK	UE_B responds with 200 OK to UPDATE
48A							200 OK	IMS_B forwards 200 OK response to IMS_A
49A							200 OK	IMS_A forwards the 200 OK response to UE_A
42B								User B removes one of the media streams
43B							UPDATE	UE_B sends UPDATE to IMS_B
44B							UPDATE	IMS_B forwards the UPDATE to IMS_A
45B							UPDATE	IMS_A forwards the UPDATE to UE_A
46B								User A is informed that the media stream has been removed
47B							200 OK	UE_A responds with 200 OK to UPDATE
48B							200 OK	IMS_A forwards the 200 OK response to IMS_B
49B							200 OK	IMS_B forwards the 200 OK response to UE_B
50								User A releases the call
51							BYE	UE_A sends BYE to IMS_A
52							BYE	IMS_A forwards the BYE to IMS_B
53							BYE	IMS_B forwards the BYE to UE_B
54								User B is informed that call has ended
55							200 OK	UE_B sends 200 OK response for BYE
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

4.4.12.1.2   UC_15: SIP Call Flow "Removal of media streams using reINVITE"

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 initiates a multimedia session with at least two streams with User B
42A								User A removes one of the media streams
43A							INVITE	UE_A sends reINVITE to IMS_A
44A							100 Trying	IMS_A responds with a 100 Trying provisional response
45A							INVITE	IMS_A forwards the reINVITE to IMS_B
46A							100 Trying	IMS_B responds with a 100 Trying provisional response
47A							INVITE	IMS_B forwards the reINVITE to UE_B
48A							100 Trying	UE_B optionally responds with a 100 Trying provisional response
49A								User B is informed that the media stream has been removed
50A							200 OK	UE_B responds with 200 OK to reINVITE
51A							200 OK	IMS_B forwards the 200 OK response to IMS_A
52A							200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
53A			→				ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
54A				→			ACK	IMS_A forwards the ACK to IMS_B
55A					→		ACK	IMS_B forwards the ACK to UE_B
42B					←			User B removes one of the media streams
43B				←			INVITE	UE_B sends reINVITE to IMS_B
44B				→			100 Trying	IMS_B responds with a 100 Trying provisional response
45B			←				INVITE	IMS_B forwards the reINVITE to IMS_A
46B			→				100 Trying	IMS_A responds with a 100 Trying provisional response
47B		←					INVITE	IMS_A forwards the reINVITE to UE_A
48B		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
49B	←							User A is informed that the media stream has been removed
50B		→					200 OK	UE_A responds with 200 OK to reINVITE
51B			→				200 OK	IMS_A forwards the 200 OK response to IMS_B
52B				→			200 OK	IMS_B forwards the 200 OK response to UE_B
53B				←			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
54B			←				ACK	IMS_B forwards ACK to IMS_A
55B		←					ACK	IMS_A forwards ACK to UE_A
56	→							User A releases the call
57		→					BYE	UE_A sends BYE to IMS_A
58			→				BYE	IMS_A forwards BYE to IMS_B
59				→			BYE	IMS_B forwards BYE to UE_B
60					→			User B is informed that call has ended
61				←			200 OK	UE_B sends 200 OK for BYE
62			←				200 OK	IMS_B forwards the 200 OK response to IMS_A
63		←					200 OK	IMS_A forwards the 200 OK response to UE_A
64	←							User A is informed that call has ended

4.4.13   Ad-hoc Conferencing service

4.4.13.1   Description

UE A registered on IMS network A, initiates an ad-hoc conf call via CONF AS, connected over ISC interface to IMS core A and subsequently invites UE B (registered in IMS B) to join the conf. This Use Case requires support for MRFC and MRFP funtiontalities on IMS_A.

The test sequence when user A initiates an ad-hoc conference call and invites user B to join it, in an interworking scenario is:

Step	Action	CF_INT_CONF CALL
1	User A initiates an ad-hoc conference call	Step 1
2	User A is informed the Ad Hoc Conference Call is being set up	Step 4
3	User A is informed the Ad Hoc Conference Call is established	Step 9
4	User A invites user B to join the ad-hoc conference call	Step 12
5	User B is informed of incoming invitation from User A to join the Conference Call	Step 27
6	User A is notified that User B is being invited to join the call	Step 33
7	User B joins the conference	Step 41
8	User A is notified that User B has joined the conference	Step 45
9	User B leaves the conference	Step 48
10	User B is informed that the conference has ended	Step 55
11	User A is notified that user B has left the conference	Step 58

NOTE 1: The proposed test configuration shown in CF_INT_CONF_CALL indicates CONF AS A (AS+MRFC+MRFP) resources in IMS A, hence the UC refers to UE_A as conference initiator in IMS A and UE_B, although the same UC applies alternatively for UE_B as conference initiator in IMS B and UE_A as participant in IMS A, which involves a CONF AS B connected to IMS B, not shown in the test configuration for simplicity purposes.

NOTE 2: For the purpose of IMS NNI conformance testing, the proposed test configuration refers to the ISC interface as an optional Point of Observation (PO), where the SIP signalling passing through it might be observed but not considered part of the conformance testing.

This proposal is consistent with the most common interoperability scenario where one vendor provides the complete solution for the conference service, integrated into a 3rd party IMS core via ISC interface.

4.4.13.2 UC_16: SIP Call Flow "Ad-hoc Conference call"

The expected call flow sequence is:

Step	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B	Message	Comment
1	→→									User A initiates an ad-hoc conference call
2		→——→							INVITE	UE_A sends INVITE to IMS_A with information for all commonly supported presence elements
3		←——←							100 Trying	IMS_A responds with a 100 Trying provisional response
4	←——									User A is informed the Ad Hoc Conference Call is being set up
5					→——→				INVITE	IMS_A forwards INVITE to IMS_A AS
6					←——←				100 Trying	IMS_A AS responds with a 100 Trying provisional response
7					←——←				200 OK	IMS_A AS responds with a 200 OK to IMS_A, with isfocus parameter.
8		←——←							200 OK	IMS_A forwards the 200OK response to UE_A
9	←——									User A is informed the Ad Hoc Conference Call is established
10		→——→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→——→				ACK	IMS_A forwards the ACK to IMS_A AS
12	→→									User A invites user B to join the ad-hoc conference call
13		→——→							REFER	UE_A sends REFER message to IMS_A, with Refer-To : <UE_B uri ;method=INVITE>

Step	Direction (User A, UE A, User B, UE B, IMS A, AS A, IMS B, AS B)	Message	Comment
14	IMS A → AS A	REFER	IMS_A forwards the REFER to IMS_A AS
15	AS A → IMS A	202 Accepted	IMS_A AS responds with a 202 Accepted
16	IMS A → User B	202 Accepted	IMS_A forwards the 202 Accepted response to UE_A
17	AS A → IMS A	NOTIFY	IMS_A AS sends a NOTIFY to IMS_A to inform the conference initiator the REFER message is being processed
18	IMS A → UE A	NOTIFY	IMS_A forwards the NOTIFY to UE_A
19	UE A → IMS A	200 OK	UE_A responds with 200 OK to IMS_A
20	IMS A → AS A	200 OK	IMS_A forwards the 200 OK response to IMS_A AS
21	AS A → IMS A	INVITE	IMS_A AS sends INVITE to UE_B with conference-factory URI (received in the REFER message from UE A)
22	IMS A → AS A	100 Trying	IMS_A responds with a 100 Trying provisional response
23	IMS A → IMS B	INVITE	IMS_A forwards the INVITE to IMS_B
24	IMS B → IMS A	100 Trying	IMS_B responds with a 100 Trying provisional response
25	IMS B → UE B	INVITE	IMS_B forwards the INVITE to UE_B
26	UE B → IMS B	100 Trying	UE_B responds with a 100 Trying provisional response
27	UE B → User B		User B is informed of incoming invitation from User A to join the Conference Call
28	UE B → IMS B	180 Ringing	UE_B sends a 180 ringing to IMS_B
29	IMS B → IMS A	180 Ringing	IMS_B forwards the 180 ringing to IMS_A
30	IMS A → AS A	180 Ringing	IMS_A forwards the 180 ringing to IMS_A AS
31	AS A → IMS A	NOTIFY	Upon reception of 180 Ringing from UE_B, IMS_A AS sends NOTIFY with sipfrag: 180 Ringing to inform conference initiator that UE_B is being invited to join the conference
32	IMS A → UE A	NOTIFY	IMS_A forwards the NOTIFY to UE_A
33	UE A → User A		User A is notified that User B is being invited to join the call
34	UE A → IMS A	200 OK	UE_A responds with 200 OK to IMS_A for NOTIFY
35	IMS A → AS A	200 OK	IMS_A forwards the 200 OK response to IMS_A AS
36	UE B → IMS B	200 OK	UE_B responds with 200 OK to IMS_B for INVITE
37	IMS B → IMS A	200 OK	IMS B forwards the 200 OK response to IMS A
38	IMS A → AS A	200 OK	IMS A forwards the 200 OK response to IMS_A AS
39	User B → UE B		User B joins the conference
40	UE B → IMS B	ACK	UE_B acknowledges the 200 OK for INVITE
41	IMS B → IMS A	ACK	IMS B forwards the ACK to IMS A
42	IMS A → AS A	ACK	IMS A forwards the ACK to IMS_A AS
43	AS A → IMS A	NOTIFY	AS_A sends NOTIFY to UE_A to inform it has successfully joined the conference
44	IMS A → UE A	NOTIFY	IMS_A forwards NOTIFY to UE_A
45	UE A → User A		User A is alerted that User B has joined the conference
46	UE A → IMS A	200 OK	UE_A sends 200 OK response for NOTIFY
47	IMS A → AS A	200 OK	IMS_A forwards the 200 OK response to IMS_A AS

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
48			→							User B leaves the conference
49				→					BYE	UE_B sends BYE to IMS_B to leave the conference
50					←				BYE	IMS_B forwards the BYE to IMS_A
51					→				BYE	IMS_A forwards the BYE to IMS_A AS
52					←				200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK response for BYE
53					→				200 OK	IMS_A forwards the 200 OK response to IMS_B
54				←					200 OK	IMS_B forwards the 200 OK response to UE_B
55			←							User B is informed that the conference has ended
56					←				NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the conference
57		←							NOTIFY	IMS_A forwards NOTIFY to UE_A
58	←									User A is notified that user B has left the conference
59		→							200 OK	UE_A sends a 200 OK response for NOTIFY
60					→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS

4.4.14 Presence service

4.4.14.1 Watcher subscription to presence event notification

4.4.14.1.1 Description

UE_B is configured to receive notifications with watcher information. UE_B publishes its presence information. UE_A subscribes to presence information state changes of UE_B. This test requires the use of application server in IMS_B (Presence Server), according to the standard [15]. The call flow path and node configuration for this use case corresponds to CF_INT_AS in case of interworking and CF_ROAM_AS 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).

Step	Action	CF_INT_AS	CF_ROAM_AS
1	User B publishes presence information	Step 1	Step 1
2	User B is informed of its presence status update	Step 6	Step 8
3	User A subscribes to presence information from User B	Step 7	Step 9
4	User B receives an authorization request from User A to be informed of its own presence information	Step 22	Step 26
5	User B authorizes user A to be informed of its own presence information	Step 23	Step 27
6	User A is informed of User B presence information	Step 28	Step 32

4.4.14.1.2 UC_17_R: SIP message flow for watcher subscription to presence event notification with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
1										User A publishes presence information
2									PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3									PUBLISH	IMS_A forwards the PUBLISH to IMS_B
4									PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
5									200 OK	IMS_B AS responds with a 200 OK to IMS_B
6									200 OK	IMS_B forwards the 200 OK response to IMS_A
7									200 OK	IMS_A forwards the 200 OK response to UE_B
8										User B is informed of its presence status update
9										User A subscribes to presence information from User B
10									SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A
11									SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_B
12									SUBSCRIBE	IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)
13									200 OK	IMS_B AS responds with a 200 OK to IMS_B
14									200 OK	IMS_B forwards the 200 OK response to IMS_A
15									200 OK	IMS_A forwards the 200 OK response to UE_A
16									NOTIFY	IMS_B AS sends NOTIFY to IMS_A
17									NOTIFY	IMS_A forwards the NOTIFY to UE_A
18									200 OK	UE_A responds with a 200 OK to IMS_A
19									200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										SUBSCRIPTION triggers the AS to send a NOTIFY to UE_B indicating the change to the watcher information subscriber
20									NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B the change to the watcher information subscriber
21									NOTIFY	IMS_B forwards the NOTIFY to IMS_A
22									NOTIFY	IMS_A forwards the NOTIFY to UE_B
23									200 OK	UE_B responds with a 200 OK to IMS_A
24									200 OK	IMS_A forwards the 200 OK response to IMS_B
25									200 OK	IMS_B forwards the 200 OK response to IMS_B AS
26										User B receives an authorization request from User A to see its own presence information
27										User B authorizes user A to be informed of its own presence information
28									NOTIFY	IMS_B AS sends NOTIFY to IMS_A

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
29									NOTIFY	IMS_A forwards the NOTIFY to UE_B
30									200 OK	UE_A responds with a 200 OK to IMS_A
31									200 OK	IMS_A forwards the 200 OK response to IMS_B AS
32										User A is informed of user B presence information
33									NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B that subscription has been authorized
34									NOTIFY	IMS_B forwards the NOTIFY to IMS_A
35									NOTIFY	IMS_A forwards the NOTIFY to UE_B
36									200 OK	UE_B responds with a 200 OK to IMS_A
37									200 OK	IMS_A forwards the 200 OK response to IMS_B
38									200 OK	IMS_B forwards the 200 OK response to IMS_B AS

4.4.14.1.3   UC_17_I: SIP message flow for watcher subscription to presence event notification with CF_INT_AS

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
1										User B publishes presence information
2									PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3									PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
4									200 OK	IMS_B AS responds with a 200 OK to IMS_B
5									200 OK	IMS_B forwards the 200 OK response to UE_B
6										User B is informed of its presence status update
7										User A subscribes to presence information from User B
8									SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A
9									SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_B
10									SUBSCRIBE	IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)
11									200 OK	IMS_B AS responds with a 200 OK to IMS_B
12									200 OK	IMS_B forwards the 200 OK response to IMS_A
13									200 OK	IMS_A forwards the 200 OK response to UE_A
14									NOTIFY	IMS_B AS sends NOTIFY to IMS_A
15									NOTIFY	IMS_A forwards the NOTIFY to UE_A
16									200 OK	UE_A responds with a 200 OK to IMS_A

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
17								→	200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										SUBSCRIPTION triggers the AS to send a NOTIFY to UE_B indicating the change to the watcher information subscriber
18							←		NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B the change to the watcher information subscriber
19				←					NOTIFY	IMS_B forwards the NOTIFY to UE_B
20				→					200 OK	UE_B responds with a 200 OK to IMS_B
21							→		200 OK	IMS_B forwards the 200 OK response to IMS_B AS
22			←							User B receives an authorization request from User A to be informed of its own presence information
23			→							User B authorizes user A to see its own presence information
24					←				NOTIFY	IMS_B AS sends NOTIFY to IMS_A
25		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
26		→							200 OK	UE_A responds with a 200 OK to IMS_A
27					→				200 OK	IMS_A forwards the 200 OK response to IMS_B AS
28	←									User A is informed of user B presence information
29							←		NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B that subscription has been authorized
30				←					NOTIFY	IMS_B forwards the NOTIFY to UE_B
31				→					200 OK	UE_B responds with a 200 OK to IMS_B
32							→		200 OK	IMS_B forwards the 200 OK response to IMS_B AS

4.4.14.2   Watcher subscription to resource list

4.4.14.2.1   Description

UE_B is configured to receive notifications with watcher information. UE_B publishes its presence information. User B has authorized User A to see its presence information. User A is authorized to use resource lists. UE_A subscribes to presence information state changes of a list of users containing UE_B. This test requires the use of application server in IMS_B, having the role of Presence Server (PS) and the use of application server in IMS_A, having the role of Resource List Server (RLS), according to the standard [15]. The call flow path and node configuration for this use case corresponds to CF_INT_AS in case of interworking and CF_ROAM_AS 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).

Step	Action	CF_INT_AS	CF_ROAM_AS
1	User B publishes presence information	Step 1	Step 1
2	User B is informed of its presence status update	Step 6	Step 8
3	User A subscribes to resource list containing User B SIP URI	Step 7	Step 9
4	User A is informed of User B presence information	Step 30	Step 32

4.4.14.2.2 UC_18_R: SIP message flow for watcher subscription to resource list with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
1	→→									User A publishes presence information
2				→→					PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3					→→				PUBLISH	IMS_A forwards the PUBLISH to IMS_B
4							→→		PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
5							←←		200 OK	IMS_B AS responds with a 200 OK to IMS_B
6					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
7				←←					200 OK	IMS_A forwards the 200 OK response to UE_B
8			←←							User B is informed of its presence status update
9	→→									User A subscribes to resource list
10		→→							SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A indicating support to "eventlist" to a resource list SIP URI
11					→→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_A AS (RLS)
										RLS performs authorization checks to ensure that User A is authorized to use resource lists
12					←←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
13		←←							200 OK	IMS_A forwards the 200 OK response to UE_A
14					←←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
15		←←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
16		→→							200 OK	UE_A responds with a 200 OK to IMS_A
17					→→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
										RLS resolves watcher resource´s address and subscribes for presence event notification for all the presentities represented by the resource list SIP URI
18					←←				SUBSCRIBE	IMS_A AS (RLS) sends SUBSCRIBE for "presence" event to IMS_A
19							→→		SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_B
20							→→		SUBSCRIBE	IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)
										PS performs authorization checks on the originator to ensure it is allowed to watch the presentity
21							←←		200 OK	IMS_B AS (PS) responds with a 200 OK to IMS_B
22					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
23					→→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS (RLS)
24					←←				NOTIFY	IMS_B AS sends a NOTIFY to IMS_A with the presence information of UE_B
25					→→				NOTIFY	IMS_A forwards the NOTIFY to IMS_A AS (RLS)

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
26									200 OK	IMS_A AS responds with a 200 OK to IMS_A
27									200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										RLS notifies with presence information for all the presentities represented by the resource list SIP URI
28									NOTIFY	IMS_A AS sends NOTIFY to IMS_A
29									NOTIFY	IMS_A forwards the NOTIFY to UE_A
30									200 OK	UE_A responds with a 200 OK to IMS_A
31									200 OK	IMS_A forwards the 200 OK response to IMS_A AS
32										User A sees user B presence information

4.4.14.2.3 UC_18_I: SIP message flow for watcher subscription to resource list with CF_INT_AS

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
1										User B publishes presence information
2									PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3									PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
4									200 OK	IMS_B AS responds with a 200 OK to IMS_B
5									200 OK	IMS_B forwards the 200 OK response to UE_B
6										User B is informed of its presence status update
7										User A subscribes to resource list
8									SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A indicating support to "eventlist" to a resource list SIP URI
9									SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_A AS (RLS)
										RLS performs authorization checks to ensure that User A is authorized to use resource lists
10									200 OK	IMS_A AS responds with a 200 OK to IMS_A
11									200 OK	IMS_A forwards the 200 OK response to UE_A
12									NOTIFY	IMS_A AS sends NOTIFY to IMS_A
13									NOTIFY	IMS_A forwards the NOTIFY to UE_A
14									200 OK	UE_A responds with a 200 OK to IMS_A
15									200 OK	IMS_A forwards the 200 OK response to IMS_A AS
										RLS resolves watcher resource´s address and subscribes for presence event notification for all the presentities represented by the resource list SIP URI

Step	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B	Message	Comment
16					←				SUBSCRIBE	IMS_A AS (RLS) sends SUBSCRIBE for "presence" event to IMS_A
17					→→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_B
18							→→		SUBSCRIBE	IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)
										PS performs authorization checks on the originator to ensure it is allowed to watch the presentity
19							←		200 OK	IMS_B AS (PS) responds with a 200 OK to IMS_B
20					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
21					→→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS (RLS)
22					←←←				NOTIFY	IMS_B AS sends a NOTIFY to IMS_A with the presence information of UE_B
23					→→				NOTIFY	IMS_A forwards the NOTIFY to IMS_A AS (RLS)
24					←←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
25					→→→→				200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										RLS notifies with presence information for all the presentities represented by the resource list SIP URI
26					←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
27		←←←←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
28		→→→→							200 OK	UE_A responds with a 200 OK to IMS_A
29					→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
30	←									User A sees user B presence information

4.4.15 IPTV service

4.4.15.1 Broadcast (BC) Session

4.4.15.1.1   Description

UE_A starts a session initiation procedure to join a multicast channel. This test requires the use of application server as specified in [14]. The call flow path and node configuration for this use case corresponds to CF_IPTV.

4.4.15.1.2   UC_19: BC session

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

Step	Action	CF_IPTV
1	User A initiates a BC session	Step 1
2	User A receives the broadcast content	Step 8
3	User A terminates the session	Step 9
4	User A is informed that session is terminated	Step 14

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 initiates a BC session
2		→→→→							INVITE	UE_A sends INVITE to IMS_A
3					→→				INVITE	IMS_A forwards the INVITE to AS_A
4					←←				200 OK	AS_A responds with 200 OK
5		←←←←							200 OK	IMS_A forwards the 200 OK response to UE_A
6		→→→→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
7					→→				ACK	IMS_A forwards the ACK to AS_A
8	←←←←←←									User A receives the broadcast content
9	→→									User A terminates the session
10		→→→→							BYE	UE_A sends BYE to IMS_A
11					→→				BYE	IMS_A forwards the BYE to AS_A
12					←←				200 OK	AS_A responds with 200 OK
13		←←←←							200 OK	IMS_A forwards the 200 OK response to UE_A
14	←←									User A is informed that session is terminated

4.4.15.2 Content on Demand (CoD) Session

4.4.15.2.1 Description

UE_A starts a session initiation procedure for a streaming session of a selected content. The document [14] specifies two methods for establishing a streaming session (called RTSP Method 1 and 2). This tests requires the use of application server, playing the roles of Service control Function (SCF) and Media Function (MF), as specified in [14]. The call flow path and node configuration for this use case corresponds to CF_IPTV.

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

Step	Action	CF_IPTV RTSP Method 1	CF_IPTV RTSP Method 2
1	User A initiates a CoD session (content selection)	Step 1	Step 1
2	User A starts receiving the streaming content	Step 26	Step 14
3	User A terminates the session	Step 27	Step 15
4	User A is informed that session is terminated	Step 36	Step 24

4.4.15.2.2   UC_20: CoD session establishing content control channel and content delivery channels separately (RTSP Method 1)

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 initiates a CoD session (content selection)
2		→→							INVITE	UE_A sends a INVITE to IMS_A
3					→→				INVITE	IMS_A forwards the INVITE to AS_A (SCF)
4					←←				INVITE	AS_A forwards the INVITE to IMS_A
5					→→				INVITE	IMS_A forwards the INVITE to AS_A (MF)
6					←←				200 OK	AS_A (MF) responds with 200 OK
7					→→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8					←←				200 OK	AS_A forwards the 200 OK response to IMS_A
9		←←							200 OK	IMS_A forwards the 200 OK response to UE_A
10		→→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→→				ACK	IMS_A forwards the ACK to AS_A (SCF)
12					←←				ACK	AS_A forwards the ACK to IMS_A
13					→→				ACK	IMS_A forwards the ACK to AS_A (MF)
										UE_A sets up RTSP with AS_A (MF)
14		→→							INVITE	UE_A sends reINVITE message indicating media attribute " a=recvonly "
15					→→				INVITE	IMS_A forwards the reINVITE to AS_A (SCF)
16					←←				INVITE	AS_A forwards the reINVITE to IMS_A
17					→→				INVITE	IMS_A forwards the reINVITE to AS_A (MF)
18					←←				200 OK	AS_A (MF) responds with 200 OK
19					→→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
20					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
21		←←							200 OK	IMS_A forwards the 200 OK response to UE_A
22		→→							ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
23					→→				ACK	IMS_A forwards the ACK to AS_A (SCF)
24					←←				ACK	AS_A forwards the ACK to IMS_A
25					→→				ACK	IMS_A forwards the ACK to AS_A (MF)
26		←←←←								User A starts receiving the streaming content
27	→→									User A terminates the session
28		→→							BYE	UE_A sends a BYE to IMS_A
29					→→				BYE	IMS_A forwards the BYE to AS_A (SCF)
30					←←				BYE	AS_A forwards the BYE to IMS_A
31					→→				BYE	IMS_A forwards the BYE to AS_A (MF)
32					←←				200 OK	AS_A (MF) responds with 200 OK
33					→→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
34					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
35		←←							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		
36	←									User A is informed that session is terminated

4.4.15.2.3   UC_21: CoD session establishing content control channel and content delivery channels separately using RTSP Method 2

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 initiates a CoD session (content selection)
2		→							INVITE	UE_A sends a INVITE to IMS_A
3					→				INVITE	IMS_A forwards the INVITE to AS_A (SCF)
4					←				INVITE	AS_A forwards the INVITE to IMS_A
5					→				INVITE	IMS_A forwards the INVITE to AS_A (MF)
6					←				200 OK	AS_A (MF) responds with 200 OK
7					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8					←				200 OK	AS_A forwards the 200 OK response to IMS_A
9		←							200 OK	IMS_A forwards the 200 OK response to UE_A
10		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→				ACK	IMS_A forwards the ACK to AS_A (SCF)
12					←				ACK	AS_A forwards the ACK to IMS_A
13					→				ACK	IMS_A forwards the ACK to AS_A (MF)
14										UE_A starts receiving the streaming content
15	→									User A terminates the session
16		→							BYE	UE_A sends a BYE to IMS_A
17					→				BYE	IMS_A forwards the BYE to AS_A (SCF)
18					←				BYE	AS_A forwards the BYE to IMS_A
19					→				BYE	IMS_A forwards the BYE to AS_A (MF)
20					←				200 OK	AS_A (MF) responds with 200 OK
21					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
22					←				200 OK	IMS_B forwards the 200 OK response to IMS_A
23		←							200 OK	IMS_A forwards the 200 OK response to UE_A
24	←									User A is informed that session is terminated

4.4.15.3   Request for Network PVR offline capture

4.4.15.3.1   Description

UE_A starts a N-PVR offline capture procedure to record a live programme that has not started yet. Once the capture has finished, UE_A establishes a CoD session to receive the streaming content using RTSP Method 1 or RTSP

Method 2. The scope of this Use Case is to describe the capturing procedure, since CoD session is already described in the previous section. This test requires the use of an application server, as specified in [14]. The call flow path and node configuration for this use case corresponds to CF_IPTV.

4.4.15.3.2   UC_22: Request for Network PVR offline capture.

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_IPTV
1	User A requests to record a live programme that has not started yet	Step 1
2	User A is informed that recording has started	Step 6

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 requests to record a live programme that has not started yet
2		→		→	→				MESSAGE	UE_A sends a MESSAGE to IMS_A
3					→	→			MESSAGE	IMS_A forwards the MESSAGE to AS_A
4					←	←			200 OK	AS_A responds with 200 OK
5		←		←	←				200 OK	IMS_A forwards the 200 OK response to UE_A
6	←←									User A is informed that recording has started

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 TS 124 229 [1].

4.5.1 General Capabilities

4.5.1.1 SIP messages longer than 1 500 bytes

Interoperability Test Description	
Identifier:	TD_IMS_MESS_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	TS 124 229 [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_REG_0001	
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	TS 124 229 [1], clause 5.2.2 ¶2
	TP_IMS_5011_02	TS 124 229 [1], clause 5.2.2 ¶2
	TP_IMS_5044_01	TS 124 229 [1], clause 5.2.3 ¶1
	TP_IMS_5089_01	TS 124 229 [1], clause 5.4.1.2.1 ¶6
	TP_IMS_5092_01	TS 124 229 [1], clause 5.4.1.2.2 ¶1
	TP_IMS_5096_01	TS 124 229 [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 an orig-ioi_parameter and* 　　　　*not containing a term-ioi_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 an orig-ioi_parameter
		         indicating IMS_A and
		        not containing a term-ioi_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
		        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 P-Charging-Vector_header* * including a term-ioi_parameter* * indicating operator_identifier 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
			U s e r B	U E B	I M S A	I M S 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

Step	Direction					Message	Comment
		User B	UE B	IMS A	IMS B		
17			←			200 OK or 202 Accepted	IMS_A forwards the 200 OK response to UE_B or 202 Accepted
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_REG_0002	
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	TS 124 229 [1], clause 5.2.2 ¶26
	TP_IMS_5092_01	TS 124 229 [1], clause 5.4.1.2.2 ¶1
Use Case ref.:	UC_01_R	
<td colspan="3" style="background:red"></td>		
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	
<td colspan="3" style="background:red"></td>		
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows successful registration
<td colspan="3" style="background:red"></td>		
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 }
		}

Interoperability Test Description		

	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 P-Charging-Vector_header
		          including a term-ioi_parameter
		            indicating operator_identifier of IUT_ and
		        containing a Contact_header
		          indicating "all contact addresses"
		            for the default_public_user_identity of UE_B }
		}

Step			User B	UE B	IMS A	IMS B	Message	Comment
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_REG_0002H
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	TS 124 229 [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
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

Step	Direction					Message	Comment
			U s e r B	U E B	I M S A	I M S 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_REG_0003	
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	TS 124 229 [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_A* * and IMS_B receives the REGISTER from IMS_A}* * then { IMS_B sends a 403_response to IMS_A }* *}*

Step	Direction					Message	Comment
			U s e r B	U E B	I M S A	I M S 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_REG_0003H		
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		TS 124 229 [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		
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_A and
		      IMS_B sends the REGISTER to IMS_B }
		  then { IMS_B sends a 403_response to IMS_A }
		}	

Step	Direction						Message	Comment
			U s e r B	U E B	I M S A	I M S 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

Void.

4.5.2.7   Network initiated deregistration by the S-CSCF

Interoperability Test Description			
Identifier:	TD_IMS_REG_0005		
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		TS 124 229 [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		

Interoperability Test Description		
	• IMS_A within the trust domain of IMS_B	
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 a 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_A* * a registration_element* * (containing an aor_attribute* * indicating registered_public_identity of UE_A 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_A) }* *}*

Step			User B	U E B	I M S A	I M S B	Message	Comment
								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
		U s e r B	U E B	I M S A	I M S 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_REG_0006	
Summary:	IMS network can initiate user re-authentication.	
Configuration:	CF_ROAM_REG	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5094_01	TS 124 229 [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 a 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
31				←		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_REG_0007	
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	TS 124 229 [1], clause 5.10.4.1 ¶5
	TP_IMS_5405_01	TS 124 229 [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
Conformance Criteria:	Check	
	1	TP_IMS_5134_01 in CFW step 3, 7 (REGISTER):

Interoperability Test Description		
		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 }* *}*
	2	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
			U s e r B	U E B	I M S A	I M S 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 to the SUBSCRIBE with a 200 OK or 202 Accepted
17							200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_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

4.5.3   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 with DNS/ENUM lookup procedure

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0001	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_04	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶37
	TP_IMS_5131_02	TS 124 229 [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 an access-network-charging-info_parameter and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI 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* *}* *then { IMS_B receives the initial INVITE* *containing a P-Asserted-Identity_header* *indicating the SIP_URI of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating the 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 an 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 }* *}*
	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* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A }* *}*

	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 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_5115_03 in CFW step 10 (180 Ringing):
		 ensure that {
		   when { UE_B sends a 1xx_response to UE_A
		       }
		   then { IMS_A receives the 1xx_response from IMS_B
		           containing a P-Asserted-Identity_header
		             indicating the SIP_URI of UE_B and
		           containing a P-Asserted-Identity_header
		             indicating the Tel_URI of UE_B }
		 }

	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
		       }
		   then { IMS_A receives the 2xx_response from IMS_B
		           containing a P-Asserted-Identity_header
		             indicating the SIP_URI of UE_B and
		           containing a P-Asserted-Identity_header
		             indicating the 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
		           not containing a P-Charging-Function-Addresses_header }
		 }

Step	Direction							Message	Comment
	User A	UE A	IMS A	DNS	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

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

4.5.3.1.1.2 Default SIP URI

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0001F	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶37
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶37

Interoperability Test Description		
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 an access-network-charging-info_parameter and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI and* *not containing a P- access-network-info header}* *}*
	2	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 }* *}*
	3	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* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A }* *}*
	4	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 an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	5	TP_IMS_5115_02 in CFW step 24 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }*

Interoperability Test Description		
		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* *}*
	6	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 }* *}*
	7	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* *not containing a P-Charging-Function-Addresses_header }* *}*

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

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

4.5.3.1.1.3   Default Tel URI

Interoperability Test Description		
Identifier:	TD_IMS__CALL_0002	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶49
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶39
	TP_IMS_5131_01	TS 124 229 [1], clause 5.4.3.3 ¶37
	TP_IMS_5131_02	TS 124 229 [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

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 an access-network-charging-info_parameter and
		    not containing a term-ioi_parameter) and
		  containing a Record-Route_header
		    indicating the originating S-CSCF_SIP_URI 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
		}
		  then { IMS_B receives the initial INVITE
		    containing a P-Asserted-Identity_header
		      indicating the SIP_URI of UE_A
		    and
		    containing a P-Asserted-Identity_header
		      indicating the Tel_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 }
		}

	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
		    not containing Route_header
		      indicating the S-CSCF_SIP_URI of IMS_A }
		}

	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 an 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_03 in CFW step 10 (180 Ringing):
		ensure that {
		  when { UE_B sends a 1xx_response to UE_A
		}
		  then { IMS_A receives the 1xx_response
		    containing a P-Asserted-Identity_header
		      indicating the SIP_URI of UE_B and
		    containing a P-Asserted-Identity_header
		      indicating the Tel_ URI of UE_B }
		}

	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

				Interoperability Test Description
				indicating operator_identifier of IMS_A and *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* }

	8			TP_IMS_5115_04 in CFW step 15 (2xx):
				ensure that {
				  when { UE_B sends a 2xx_response to UE_A
				}
				  then { IMS_A receives the 2xx_response
				    containing a P-Asserted-Identity_header
				      indicating the SIP_URI of UE_B and
				    containing a P-Asserted-Identity_header
				      indicating the Tel_URI of UE_B }
				}

	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_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
				    not containing a P-Charging-Function-Addresses_header }
				}

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

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0003	
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	TS 124 229 [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

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0004
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	TS 124 229 [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	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 with 404 Not Found to IMS_A**
7		←	←				404 Not Found	IMS_A forwards the 404 Not Found response to UE_A

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0005	
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	TS 124 229 [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	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			←				**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_CALL_0006	
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	TS 124 229 [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	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			←←				**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_CALL_0007	
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	TS 124 229 [1], clause 5.2.6.3 ¶5
	TP_IMS_5070_01	TS 124 229 [1], clause 5.2.7.3 ¶6
	TP_IMS_5301_01	TS 124 229 [1], clause 5.4.3.3 ¶56
	TP_IMS_5055_01	TS 124 229 [1], clause 5.2.6.4 ¶15
	TP_IMS_5055_02	TS 124 229 [1], clause 5.2.6.4 ¶15
	TP_IMS_5108_01	TS 124 229 [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 a topmost Route_header* * not indicating the P-CSCF_SIP_URI of IMS_A and* * containing a Route_header* * indicating the "list of Service Route header URIs* * from the registration" 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 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* * not containing P-Preferred-Identity_header and* * containing a P-Asserted-Identity_header* * containing an address of UE_B and* * containing a P-Charging-Vector_header* * containing an icid_parameter }* *}*
	2	TP_IMS_5070_01 in CFW step 7 (100 Trying) *ensure that {* * when { IMS_A receives an initial INVITE from IMS_B }* * then { IMS_A sends a 100_response to IMS_B* * }* *}*
	3	TP_IMS_5055_01 in CFW step 12 (180 Ringing) *ensure that {* * when { IMS_A receives a 180_response from UE_A }* * then { IMS_A sends a 180_response to IMS_B* * containing a Record-Route_header* * containing the P-CSCF_SIP_URI and* * 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 public identity "sent in P-Called_Party-ID header* * sent in the initial request" }* *}*
	4	TP_IMS_5055_02 in CFW step 18 (200 OK) *ensure that {* * when { IMS_A receives a 200_response from UE_A }* * then { IMS_A sends the 200_response to IMS_B* * containing a Record-Route_header* * containing the P-CSCF_SIP_URI and* * 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			
	5	TP_IMS_5108_01 in CFW step 6 (INVITE): *ensure that {* *when { UE_B sends an initial INVITE to UE_A* *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
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**

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	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_CALL_0008	
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	TS 124 229 [1], clause 5.2.9.2 ¶1
	TP_IMS_5082_01	TS 124 229 [1], clause 5.2.9.2 ¶2
	TP_IMS_5120_01	TS 124 229 [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
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* *}* *}*

		Interoperability Test Description	
	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	
		containing a topmost Route_header	
		not indicating 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)
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_CALL_0009	
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	TS 124 229 [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
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	**UE A**	**User B**	**UE B**	**IMS A**	**IMS B**		
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_CALL_0010	
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	TS 124 229 [1], clause 5.2.6.3 ¶26
	TP_IMS_5080_01	TS 124 229 [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
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 a topmost Route_header* * not indicating the P-CSCF_SIP_URI of IMS_A and* * 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	UE A	User B	UE B	IMS A	IMS B		
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**
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_CALL_0011	
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	TS 124 229 [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

Step	Direction						Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS 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_CALL _0012	
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	TS 124 229 [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
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* * containing a topmost Route_header* * not indicating 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

Void.

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_CALL_0014
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 TS 124 229 [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* * not containing 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
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_CALL_0015
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**

Interoperability Test Description		
	TP_IMS_5073_01	TS 124 229 [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

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
		        containing Reason_header
		          indicating "503 Service Unavailable" and
		        containing
		        "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

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0016	
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	TS 124 229 [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 a Reason_header and* 　*containing "further headers, based on local policy or the* 　　*requested session 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 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_CALL_0017	
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	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_02	TS 124 229 [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* *containing a Route_header* *not indicating the S-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *not containing an access-network-charging-info_parameter* *}* *}*
	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 }* *}*

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
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**

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0018	
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	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_02	TS 124 229 [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 an access-network-charging-info_parameter
		            }
		}

		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 }* *}*

Step	Direction						Message	Comment
	U s e r A	**U E A**	**I M S A**	**I M S B**	**U E B**	**U s e r 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

4.5.3.1.3.6   Addition of media streams (reINVITE)

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0019	
Summary:	IMS network handles subsequent INVITEs correctly when adding new media stream.	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶75
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶75
Use Case ref.:	UC_13	
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 UE_B support multiple media streams (eg. audio, video, messaging) and support RTP and MSRP • 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 (IMS VoIP call)
	2	Verify that User B is informed of incoming call of User A

Interoperability Test Description		
	3	Verify that User A is informed that UE_A 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 call is established
	7	User A adds a new media stream
	8	Verify that User B is informed to accept new media stream (optional)
	9	Verify that User A is informed to accept new media stream (optional)
	10	If informed, User B accepts the new media stream
	11	Verify that User A is informed that new media stream has been accepted
	12	User A releases the call
	13	Verify that user B is informed that call has ended
	14	Verify that user A is informed that call has ended

Conformance Criteria:	Check	

	1	TP_IMS_5106_01 in CFW step 25A:
		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
		        containing a Route_header
		          not indicating the S-CSCF_SIP_URI of IMS_A and
		        containing a P-Charging-Vector_header
		          not containing a access-network-charging-info_parameter }
		}

	2	TP_IMS_5121_01 in CFW step 26A, 31A (180 ringing):
		ensure that {
		  when { UE_B sends a 1xx response to UE_A }
		  then { IMS_A receives the 1xx response
		        containing a P-Charging-Vector_header
		          not containing a access-network-charging-info_parameter }
		}

	3	TP_IMS_5121_02 in CFW step 36A, 48 (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 }
		}

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
22A	→							User A adds a new media stream
23A		→					INVITE	UE_A sends reINVITE message with new media stream in SDP
24A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
25A			→				**INVITE**	**IMS_A forwards the 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					→			Verify that User B is informed to accept/reject new media stream (optional)
30A				←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
31A			←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
32A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
33A	←							Verify that User A is informed that UE_B is alerting User B (optional)
34A					←			If informed, User B accepts the new media stream
35A				←			200 OK	UE_B responds with 200 OK to reINVITE
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 new media stream has been accepted
39A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
40A			→				ACK	IMS_A forwards ACK to IMS_B
41A				→			ACK	IMS_B forwards ACK to UE_B
42	→						BYE	User A releases the call
43		→					BYE	UE_A sends BYE to indicate that the call has ended
44			→				BYE	IMS_A sends a BYE to IMS_B
45				→			BYE	IMS_B forwards the BYE response to UE_B
46					→		BYE	UE_B is informed that call has ended
47				←			200 OK	UE_B responds to the BYE with 200 OK
48			←				**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
49		←					200 OK	IMS_A forwards the 200 OK response to UE_A
50	←							User A is informed that call has ended

4.5.3.1.3.7　　　　　　　　Modification of an existing media stream (reINVITE)

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0020	
Summary:	IMS network handles subsequent INVITEs and UPDATEs correctly during modification of an existing media stream.	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶75
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶75
Use Case ref.:	UC_13	
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 UE_B support multiple media streams (eg. audio, video, messaging) and support RTP and MSRP • 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 (IMS VoIP call)
	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 call is established

			Interoperability Test Description
		7	User A adds a new media stream
		8	Verify that User B is informed to accept/reject new media stream (optional)
		9	Verify that User A is informed that UE_B is alerting User B (optional)
		10	If informed, verify that User B accepts the new media stream
		11	Verify that User A is informed that new media stream has been accepted (optional)
		12	User A modifies the media stream
		13	Verify that User B is informed to accept/reject media stream modification (optional)
		14	Verify that User A is informed that UE_B is alerting User B (optional)
		15	If informed, verify that User B accepts the media stream modification
		16	Verify that User A is informed that media stream modification has been accepted (optional)
		17	User B releases the call
		18	User A is informed that the call has ended
		19	User B is informed that call has ended
Conformance Criteria:	**Check**		
	1		TP_IMS_5106_01 in CFW step 25A and 45A (reINVITE): *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* *containing Route_header* *not indicating the S-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	2		TP_IMS_5121_01 in CFW step 26A, 31A (180 ringing): *ensure that {* *when { UE_B sends a 1xx response to UE_A }* *then { IMS_A receives the 1xx response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	3		TP_IMS_5121_02 in CFW step 36A and 56A (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 }* *}*

Step	**Direction**						**Message**	**Comment**
	User A	**UE A**	**IMS A**	**IMS B**	**UE B**	**User B**		
22A	→→							User A adds a new media stream
23A		→→					INVITE	UE_A sends reINVITE message with new media stream in SDP
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					→→			Verify that User B is informed to accept/reject new media stream (optional)
30A				←←			180 Ringing	UE_B responds to reINVITE with 180 Ringing

Step	User A	UE A	IMS A	IMS B	UE B	User B	Message	Comment
31A				←			**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
32A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
33A	←							Verify that User A is informed that UE_B is alerting User B (optional)
34A						←		If informed, verify that User B accepts the new media stream
35A					←		200 OK	UE_B responds to reINVITE with 200 OK with new media stream (recvonly)
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	←							Verify that User A is informed that new media stream has been accepted (optional)
39A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
40A			→				ACK	IMS_A forwards ACK to IMS_B
41A				→			ACK	IMS_B forwards ACK to UE_B
42A	→							User A modifies the media stream
43A		→					INVITE	UE_A sends reINVITE message with new media stream in SDP
44A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
45A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
46A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
47A				→			INVITE	IMS_B forwards INVITE to UE_B
48A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
49A					→			Verify that User B is informed to accept/reject media stream modification (optional)
50A				←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
51A			←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
52A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
53A	←							Verify that User A is informed that UE_B is alerting User B (optional)
54A						←		If informed, verify that User B accepts the media stream modification
55A					←		200 OK	UE_B responds to reINVITE with 200 OK with new media stream
56A				←			**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
57A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
58A	←							Verify that User A is informed that media stream modification has been accepted (optional)
59A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
60A			→				ACK	IMS_A forwards ACK to IMS_B
61A				→			ACK	IMS_B forwards ACK to UE_B
62						←	BYE	User B releases the call
63				←			BYE	UE_B releases the call with BYE to IMS_B
64			←				BYE	IMS_B forwards BYE to IMS_A
65		←					BYE	IMS_A forwards BYE to UE_A
66	←							User A is informed that the call has ended
67		→					200 OK	UE_A sends 200 OK for BYE
68			→				200 OK	IMS_A forwards 200 OK response to IMS_B
69				→			200 OK	IMS_B forwards 200 OK to UE_B
70					→			User B is informed that call has ended

4.5.3.1.3.8   Hold/resume media streams (reINVITE)

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0021	
Summary:	IMS network handles subsequent INVITEs correctly during hold/resume of media streams.	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	Test Purpose	Specification Reference
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶75
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶75
Use Case ref.:	UC_13, UC_14	
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 UE_B support multiple media streams (eg. audio, video, messaging) and support RTP and MSRP • 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 (IMS VoIP call)
	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 call is established
	7	User A adds a new media stream
	8	Verify that User B is informed to accept/reject new media stream (optional)
	9	Verify that User A is informed that UE_B is alerting User B (optional)
	10	If informed, verify that User B accepts the new media stream
	11	Verify that User A is informed that new media stream has been accepted (optional)
	12	User A puts one media stream on hold
	13	User B is informed that media stream is on hold
	14	User A is informed that media stream is on hold
	15	User A resumes the media stream
	16	User B is informed that the media stream is resumed
	17	User A is informed that the media stream is resumed
	18	User A removes one of the media streams
	19	User B is informed that the media stream has been removed
	20	User A may be informed that UE_B is alerting User B (optional)
	21	User A releases the call
	22	User B is informed that call has ended
	23	User A is informed that call has ended
Conformance Criteria:	**Check**	

	1	TP_IMS_5106_01 in CFW step 25A, 45A, 60A, 72A (reINVITE):
		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
		        containing Route_header
		          not indicating the S-CSCF_SIP_URI of IMS_A and
		        containing a P-Charging-Vector_header
		          not containing a access-network-charging-info_parameter }
		}

		Interoperability Test Description	
	2	TP_IMS_5121_01 in CFW step 31A, 46A, 61A, 73A (100 trying), 78A (180 ringing)	
		ensure that {	
		when { UE_B sends a 1xx response to UE_A }	
		then { IMS_A receives the 1xx response	
		containing a P-Charging-Vector_header	
		not containing a access-network-charging-info_parameter }	
		}	
	3	TP_IMS_5121_02 in CFW step 36A, 51A, 66A, 82A (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 }	
		}	

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
22A	→							User A adds a new media stream
23A		→					INVITE	UE_A sends reINVITE message with new media stream in SDP
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					→			Verify that User B is informed to accept/reject new media stream (optional)
30A				←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
31A			←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A**
32A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
33A	←							Verify that User A is informed that UE_B is alerting User B (optional)
34A				←				If informed, verify that User B accepts the new media stream
35A				←			200 OK	UE_B responds to reINVITE with 200 OK with new media stream in SDP (e.g. "m=message 8700 TCP/MSRP *")
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	←							Verify that User A is informed that new media stream has been accepted (optional)
39A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
40A			→				ACK	IMS_A forwards ACK to IMS_B
41A				→			ACK	IMS_B forwards ACK to UE_B
42A	→							User A puts one media stream on hold
43A		→					INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
44A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
45A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
46A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
47A				→			INVITE	IMS_B forwards INVITE to UE_B

Step	User A	UE A	IMS A	IMS B	UE B	User B	Message	Comment
48A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
49A					→			User B is informed that media stream is on hold
50A				←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
51A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
52A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
53A	←							User A is informed that media stream is on hold
54A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
55A			→				ACK	IMS_A forwards ACK to IMS_B
56A				→			ACK	IMS_B forwards ACK to UE_B
57A	→							User A resumes the media stream
58A		→					INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
59A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
60A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
61A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
62A				→			INVITE	IMS_B forwards INVITE to UE_B
63A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
64A					→			User B is informed that the media stream is resumed
65A				←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
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 the media stream is resumed
69A	→							User A removes one of the media streams
70A		→					INVITE	UE_A sends reINVITE to IMS_A
71A		←					100 Trying	IMS_A responds with a 100 Trying provisional response
72A			→				**INVITE**	**IMS_A forwards INVITE to IMS_B**
73A			←				**100 Trying**	**IMS_B responds with a 100 Trying provisional response**
74A				→			INVITE	IMS_B forwards INVITE to UE_B
75A				←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
76A					→			User B is informed that the chat media stream has been removed
77A				←			180 Ringing	UE_B optionally responds to reINVITE with 180 Ringing
78A			←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IMS_A (only if UE_B responds to reINVITE with 180 Ringing in 30A)**
79A		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A (only if UE_B responds to reINVITE with 180 Ringing in 30A)
80A	←							User A may be informed that UE_B is alerting User B (optional)
81A				←			200 OK	UE_B responds to INVITE with 200 OK with SDP where the port number for the video stream is set to zero (e.g. "m=message 0 TCP/MSRP *")
82A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
83A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
84A		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction						Message	Comment
	U s e r A	**U E A**	**I M S A**	**I M S B**	**U E B**	**U s e r B**		
85A			→				ACK	IMS_A forwards ACK to IMS_B
86A				→			ACK	IMS_B forwards ACK to UE_B

4.5.3.1.3.9   Hold/resume media streams (UPDATE)

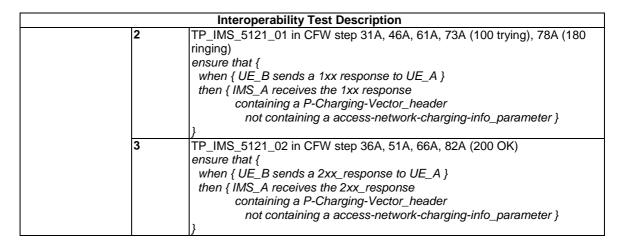| Interoperability Test Description		
Identifier:	TD_IMS_CALL_0022	
Summary:	IMS network handles subsequent UPDATEs correctly during hold/resume of media streams.	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	Test Purpose	Specification Reference
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶42
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶75
Use Case ref.:	UC_13, UC_14	
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 UE_B support multiple media streams (eg. audio, video, messaging) and support RTP and MSRP • 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 (IMS VoIP call)
	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 call is established
	7	User A adds a new media stream
	8	Verify that User B is informed to accept/reject new media stream (optional)
	9	Verify that User A is informed that UE_B is alerting User B (optional)
	10	If informed, verify that User B accepts the new media stream
	11	Verify that User A is informed that new media stream has been accepted (optional)
	12	User A puts one media stream on hold
	13	User B is informed that media stream is on hold
	14	User A is informed that media stream is on hold
	15	User A resumes the media stream
	16	User B is informed that the media stream is resumed
	17	User A is informed that the media stream is resumed
	18	User A removes one of the media streams
	19	User B is informed that the media stream has been removed
	20	User A releases the call
	21	UE_B is informed that call has ended
	22	User A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_02 in CFW step 44A and 53A (UPDATE): *ensure that {* *when { UE_A sends an UPDATE to UE_B }* *then { IMS_B receives the UPDATE* *containing a Record-Route_header*

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Interoperability Test Description	
	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 }* *}*

2	TP_IMS_5121_02 (IMS_B) in CFW step 48A, 57A and 66A (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 }
	}

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
42A	→							User A puts one media stream on hold
43A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
44A			→				**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
45A				→			UPDATE	IMS_B forwards UPDATE to UE_B
46A					→			User B is informed that media stream is on hold
47A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
48A			←				**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
49A		←					200 OK	IMS_A P-CSCF forwards the 200 OK response to UE_A
50A	←							User A is informed that media stream is on hold
51A	→							User A resumes the media stream
52A		→					UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
53A			→				**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
54A				→			UPDATE	IMS_B forwards UPDATE to UE_B
55A					→			User B is informed that the media stream is resumed
56A				←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
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 the media stream is resumed
60A	→							User A removes one of the media streams
61A		→					UPDATE	UE_A sends UPDATE to IMS_B
62A			→				**UPDATE**	**IMS_A forwards UPDATE to IMS_B**
63A				→			UPDATE	IMS_B forwards UPDATE to UE_B
64A					→			User B is informed that the media stream has been removed
65A				←			200 OK	UE_B responds to INVITE with 200 OK
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

4.5.3.1.4   Subsequent Request Procedures - Terminating Network

Interoperability Test Description	
Identifier:	TD_IMS_CALL_0023
Summary:	IMS network ends call in case called UE looses connectivity during a call.
Configuration:	CF_INT_CALL
SUT	IMS_B

Interoperability Test Description		
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5074_01	TS 124 229 [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	
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
		      containing Reason_header
		       indicating '503 Service Unavailable' 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

Step	Direction						Message	Comment
	User A	UE A	IMS A	IMS B	UE B	User B		
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_CALL_0024	
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	TS 124 229 [1], clause 5.10.4.1 ¶7
	TP_IMS_5137_01	TS 124 229 [1], clause 5.10.4.2 ¶1
	TP_IMS_5404_01	TS 124 229 [1], clause 5.10.2.2 ¶1
	TP_IMS_5408_01	TS 124 229 [1], clause 5.10.2.3 ¶1
	TP_IMS_5408_03	TS 124 229 [1], clause 5.10.2.3 ¶1
	TP_IMS_5414_01	TS 124 229 [1], clause 5.10.3.2 ¶1
	TP_IMS_5137_02	TS 124 229 [1], clause 5.10.4.2 ¶1
	TP_IMS_5137_03	TS 124 229 [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* *indicating the IBCF_SIP_URI of IMS_A and* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Record-Route_header*

		Interoperability Test Description
		containing (encrypted_consecutive_header_entries and *a tokenized-by_parameter) and* *containing a Route_header* *indicating the IBCF_SIP_URI of IMS_A and* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*
	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-Function-Addresses_header }* *then { IMS_A sends the INVITE* *not containing 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* *indicating the IBCF_SIP_URI of IMS_A and* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) and* *containing a Route_header* *indicating the IBCF_SIP_URI of IMS_A and* *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* *indicating the IBCF_SIP_URI of IMS_A and* *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* *indicating the IBCF_SIP_URI of IMS_A and* *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 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *containing Via_header* *indicating the IBCF_SIP_URI of IMS_A and* *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 200_response to UE_A }* *then { IMS_B sends the 200_response to IMS_A* *containing a Via_header* *indicating the IBCF_SIP_URI of IMS_A and*

Interoperability Test Description
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_CALL_0025	
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	TS 124 229 [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* * indicating the IBCF_SIP_URI of IMS_A and* * 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* * indicating the IBCF_SIP_URI of IMS_A and* * 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

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_CALL_0026	
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	TS 124 229 [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
	13	User A ends call

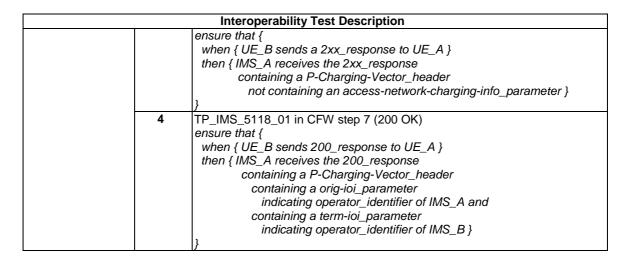| Interoperability Test Description		
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended
Conformance Criteria:	Check	

	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
		          indicating the IBCF_SIP_URI of IMS_A and
		          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
		          indicating the IBCF_SIP_URI of IMS_A and
		          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
59A					←		INVITE	IMS_B forwards INVITE to IMS_A
60A					→		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		
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_MESS_0002	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5097_06	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_02	TS 124 229 [1], clause 5.4.3.3 ¶44
	TP_IMS_5118_01	TS 124 229 [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 an access-network-charging-info_parameter and
		       not containing a term-ioi_parameter) }
		}

	2	TP_IMS_5097_06 in CFW step 3 (MESSAGE)
		ensure that {
		  when { UE_A sends a MESSAGE to UE_B
		}
		  then { IMS_B receives the MESSAGE
		      containing a P-Asserted-Identity_header
		       indicating the SIP_URI of UE_A and
		      containing a P-Asserted-Identity_header
		       indicating the Tel_URI of UE_A }
		}

	3	TP_IMS_5117_02 in CFW step 7 (200 OK)

Interoperability Test Description		
		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 an access-network-charging-info_parameter }* *}*
	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	**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

4.5.4.2   Messaging with TEL URI identities

Interoperability Test Description		
Identifier:	TD_IMS_MESS_0003	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_02	TS 124 229 [1], clause 5.4.3.3 ¶44
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶45
	TP_IMS_5117_06	TS 124 229 [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*

Interoperability Test Description		
		} *then { IMS_B receives the MESSAGE* *containing a P-Asserted-Identity_header* *indicating the SIP_URI of UE_A and* *containing a P-Asserted-Identity_header* *indicating the Tel_URI of UE_A }* *}*
	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 }* *}*
	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 }* *}*
	4	TP_IMS_5117_06 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-Asserted-Identity_header* *indicating the SIP_URI of UE_B and* *containing a P-Asserted-Identity_header* *indicating the Tel_ URI of UE_B }* *}*

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

4.5.4.3   Messaging with DNS/ENUM lookup procedure

Interoperability Test Description		
Identifier:	TD_IMS_MESS_0004	
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	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5117_06	TS 124 229 [1], clause 5.4.3.3 ¶44
Use Case ref.:	UC_05_I	

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 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
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_06 in CFW step 9 (200 OK) *ensure that {* *when { UE_B sends a 2xx_response to UE_A* *}* *then { IMS_A receives the 2xx_response* *containing a P-Asserted-Identity_header* *indicating the SIP_URI of UE_B and* *containing a P-Asserted-Identity_header* *indicating the Tel_URI of UE_B}* *}*

Step	Direction							Message	Comment
	User A	UE A	IMS A	DNS	IMS B	UE B	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_MESS_0005	
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	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶45
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 a Route_header
		         not 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 }
		}

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 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

Step	Direction						Message	Comment
	User A	**UE A**	**User B**	**UE B**	**IMS A**	**IMS B**		
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_MESS_0006	
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	TS 124 229 [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	**UE A**	**IMS A**	**IMS B**	**UE B**	**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_MESS_0007
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	TS 124 229 [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	UE A	IMS A	IMS B	UE B	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_SS_0001
Summary:	IMS network supports properly application services based on the example of the HOLD supplementary service.
Configuration:	CF_INT_AS
SUT	IMS_B
References	Test Purpose
	TP_IMS_5310_01
	TP_IMS_5312_01
Use Case ref.:	UC_10_I

References	Test Purpose	Specification Reference
	TP_IMS_5310_01	TS 124 229 [1], clause 5.4.6.1.2 ¶1
	TP_IMS_5312_01	TS 124 229 [1], clause 5.4.6.1.3 ¶1

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 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 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
Conformance Criteria:	**Check**	

	1	TP_IMS_5310_01 in CFW step 23 and Step 25 (INVITE)
		ensure that {
		  when { UE_B sends a subsequent INVITE to IMS_B
		       containing a P-Charging-Vector_header
		         containing an access-network-charging-info_parameter
		  }
		   then { IMS_B sends the INVITE to AS_B
		       containing a P-Charging-Vector_header
		         containing an access-network-charging-info_parameter
		     }
		}

	2	TP_IMS_5312_01 in CFW step 35 and Step 36 (200 OK)
		ensure that {
		  when { IMS_B receives a 200_response from IMS_A
		       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
		     }
		}

	3	TP_IMS_5310_01 in CFW step 45 and Step 47 (INVITE)
		ensure that {
		  when { UE_B sends a subsequent INVITE to IMS_B
		       containing a P-Charging-Vector_header
		         containing an access-network-charging-info_parameter
		  }
		   then { IMS_B sends the INVITE to AS_B
		       containing a P-Charging-Vector_header
		          containing an access-network-charging-info_parameter
		     }
		}

	4	TP_IMS_5312_01 in CFW step 57 and Step 58 (200 OK)
		ensure that {
		  when { IMS_B receives a 200_response from IMS_A
		       containing a P-Charging-Vector_header
		          containing an access-network-charging-info_parameter

Interoperability Test Description
} *then { IMS_B sends the 200_response to AS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*

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

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
48								100 Trying	AS_B optionally responds with a 100 Trying provisional response
49								INVITE	AS_B forwards INVITE to IMS_B
50								100 Trying	IMS_B responds with a 100 Trying provisional response
51								INVITE	IMS_B sends reINVITE to IMS_A
52								100 Trying	IMS_A responds with a 100 Trying provisional response
53								INVITE	IMS_A forwards reINVITE to UE_A
54								100 Trying	UE_A optionally responds with a 100 Trying provisional response
55									User A is informed that call is resumed
56								200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
57								**200 OK**	**IMS_A forwards 200 OK response to IMS_B**
58								**200 OK**	**IMS_B forwards 200 OK response to AS_B**
59								200 OK	AS_B forwards the 200 OK for INVITE
60								200 OK	IMS_B forwards 200 OK to IMS_A
61									User B is informed that call is resumed

4.5.5.2   Supplementary Service HOLD with AS in roaming

Interoperability Test Description		
Identifier:	TD_IMS_SS_0002	
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	TS 124 229 [1], clause 5.4.6.1.2 ¶1
	TP_IMS_5312_01	TS 124 229 [1], clause 5.4.6.1.3 ¶1
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

		Interoperability Test Description	
	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	

Conformance Criteria:	Check	
	1	TP_IMS_5310_01 in CFW step 28 and Step 32 (INVITE) *ensure that {* * when { UE_B sends a subsequent INVITE to IMS_B* * containing a P-Charging-Vector_header* * containing an access-network-charging-info_parameter* * }* * then { IMS_B sends the INVITE to AS_B* * containing a P-Charging-Vector_header* * containing an access-network-charging-info_parameter* * }* *}*
	2	TP_IMS_5312_01 in CFW step 42 and Step 43 (200 OK) *ensure that {* * when { IMS_B receives a 200_response from IMS_A* * 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* * }* *}*
	3	TP_IMS_5310_01 in CFW step 55 and Step 59 (INVITE) *ensure that {* * when { UE_B sends a subsequent INVITE to IMS_B* * containing a P-Charging-Vector_header* * containing an access-network-charging-info_parameter* * }* * then { IMS_B sends the INVITE to AS_B* * containing a P-Charging-Vector_header* * containing an access-network-charging-info_parameter* * }* *}*
	4	TP_IMS_5312_01 in CFW step 69 and Step 70 (200 OK) *ensure that {* * when { IMS_B receives a 200_response from IMS_A* * 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* * }* *}*

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
27			→						User B puts call on hold
28				→				INVITE	**UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)**

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
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
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**

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	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**
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

4.5.5.3 Supplementary Service OIP with AS

Interoperability Test Description		
Identifier:	TD_IMS_SS_0003	
Summary:	IMS network supports properly application services based on the example of the OIP supplementary service.	
Configuration:	CF_INT_AS	
SUT	IMS A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶65
Use Case ref.:	UC_08_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 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

			Interoperability Test Description
		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
Conformance Criteria:	**Check**		
	1		TP_IMS_5097_02 in CFW step 2 & 4 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_A addressed to UE_B* *}* *then { IMS_A sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the SIP_URI of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating the Tel_URI of UE_A }* *}*
	2		TP_IMS_5108_03 in CFW step 4 & 6 (INVITE) *ensure that {* *when { IMS_B receives an initial INVITE from IMS_A addressed to UE_B}* *then { IMS_B 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 IMS_B and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*
	3		TP_IMS_5115_08 in CFW step 22 and 23 (200 OK) *ensure that {* *when { IMS_B receives 200_response from AS_B addressed to UE_A }* *then { IMS_B 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 IMS_B }* *}*

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 UE_B

Step	Direction							Message	Comment
	User A	UE A	User B	UE B	IMS A	IMS B	AS B		
11				→	→			100 Trying	UE_B optionally responds with a 100 Trying provisional response
12			←						User B is informed of incoming call of User A, User A's identity is displayed
13				→	→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
14						→	→	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
15						←	←	180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
16					←	←		180 Ringing	IMS_B forwards the 180 Ringing response to IMS_A
17		←	←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
18	←	←							User A is informed that UE_B is ringing
19			→	→					User B answers call
20				→	→			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
21						→	→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
22						←	←	**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
23					←	←		**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
24		←	←					200 OK	IMS_A forwards the 200 OK response to UE_A
25	←	←							User A is informed that call has been answered

4.5.5.4　　Supplementary Service OIP with AS in roaming

Interoperability Test Description		
Identifier:	TD_IMS_SS_0004	
Summary:	IMS network supports properly application services based on the example of the OIP supplementary service.	
Configuration:	CF_ROAM_AS	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶65
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

Interoperability Test Description		
	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

Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 2 & 4 (INVITE) *ensure that {* *when { IMS_A receives an initial INVITE from UE_A addressed_to UE_B* *}* *then { IMS_A sends the initial INVITE to IMS_B* *containing a P-Asserted-Identity_header* *indicating the SIP_URI of UE_A* *and* *containing a P-Asserted-Identity_header* *indicating the Tel_URI of UE_A }* *}*
	2	TP_IMS_5108_03 in CFW step 4 & 6 (INVITE) *ensure that {* *when { IMS_B receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IMS_B 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_ and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*
	3	TP_IMS_5115_08 in CFW step 26 and 27 (200 OK) *ensure that {* *when { IMS_B receives 200_response from AS_B addressed_to UE_A }* *then { IMS_B 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

Step	User A	UE A	User B	UE B	IMS A	IMS B	AS B	Message	Comment
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

4.5.5.5 Supplementary Services OIR and ACR with AS

Interoperability Test Description		
Identifier:	TD_IMS_SS_0005	
Summary:	IMS network supports properly application services based on the example of the OIR and ACR supplementary services.	
Configuration:	CF_INT_AS	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5313_01	TS 124 229 [1], clause 5.4.6.1.3 ¶2
Use Case ref.:	UC_06_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 userOIR identity according to table 1 • UE_B is registered in IMS_B using any userACR identity according to table 1 • IMS_A is configured to contact AS_A (OIR) • UE_B is subscribed to ACR service • IMS_B is configured to contact AS_B (ACR)	
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

Interoperability Test Description		
Conformance Criteria:	Check	
	1	TP_IMS_5108_03 in CFW step 8 & 10 (INVITE) *ensure that {* * when { IMS_B receives an initial INVITE from IMS_A addressed_to UE_B }* * then { IMS_B sends the initial 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 IMS_B and* * containing a P-Charging-Vector_header* * including a orig-ioi_parameter* * indicating operator_identifier of IMS_A and* * not including a term-ioi_parameter }* *}*
	2	TP_IMS_5313_01 in CFW step 13 & 14 (433 Anonymity Disallowed) *ensure that {* * when { IMS_A receives a response from IMS_B* * containing a P-Charging-Vector_header* * including an access-network-charging-info_parameter* * }* * then { IMS_A sends the response to AS_A* * containing a P-Charging-Vector_header* * including an access-network-charging-info_parameter* * }* *}*

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**

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
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

4.5.5.6   Supplementary Services OIR and ACR with AS in roaming

Interoperability Test Description		
Identifier:	TD_IMS_SS_0006	
Summary:	IMS network supports properly application services based on the example of the OIR and ACR supplementary services.	
Configuration:	CF_ROAM_AS	
SUT	IMS_A and IMS_B	
References	Test Purpose	Specification Reference
	TP_IMS_5046_01	TS 124 229 [1], clause 5.2.6.3 ¶5
	TP_IMS_5067_01	TS 124 229 [1], clause 5.2.7.2 ¶7
	TP_IMS_5097_09	TS 124 229 [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 any userACR identity according to table 1 • UE_B is registered in IMS_B via IMS_A using userOIR identity according to table 1 • UE_A is subscribed to ACR service • IMS_B is configured to contact AS_B (OIR) • IMS_A is configured to contact AS_A (ACR) • UE_B is subscribed to OIR service	
Test Sequence:	Step	
	1	User B calls User A (i.e. userACR in IMS_B)
	2	Verify that user B is informed that call has been rejected due to ACR

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5046_01 in CFW step 2 & 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 Route_header* *not indicating the P-CSCF_SIP_URI of IMS_A and* *containing a Route_header* *indicating the "list of Service Route header URIs* *from the registration" 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 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* *not containing P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *containing an address of UE_B and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 2 & 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* *}* *}*
	3	TP_IMS_5097_09 in CFW step 4 & 6 (INVITE) *ensure that {* *when { IMS_B receives an initial INVITE from IMS_A addressed to UE_A }* *then { IMS_B 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 and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*

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 sends 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

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
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 INVITE to IMS_A
11					→				100 Trying	IMS_A responds with a 100 Trying provisional response
										INVITE triggers the ACR IFC in IMS_A
12					→				INVITE	IMS_A forwards the INVITE to IMS_A AS
13					←				100 Trying	AS optionally responds with a 100 Trying provisional response
14					←				433 Anonymity Disallowed	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
15					→				433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to IMS_B
16							→		433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_B AS
17							←		433 Anonymity Disallowed	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
18					←				433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_A
19				←					433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to UE_B
20				←						User B is informed that the call has been rejected due to ACR
21				→					ACK	UE_B sends ACK to IMS_A
22					→				ACK	IMS_A sends ACK to IMS_B
23							→		ACK	IMS_B forwards the ACK to IMS_B AS
24							←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
25					←				ACK	IMS_B forwards ACK to IMS_A
26					→				ACK	IMS_A forwards ACK to IMS_A AS

4.5.5.7   Supplementary Service CFU with AS

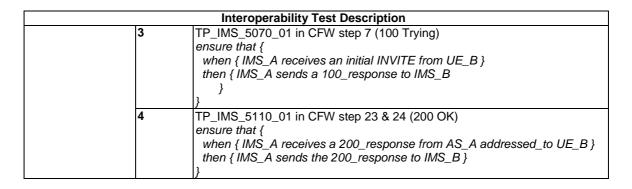| Interoperability Test Description		
Identifier:	TD_IMS_SS_0007	
Summary:	IMS network supports properly application services based on the example of the CFU supplementary service.	
Configuration:	CF_INT_AS	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_01	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶65
Use Case ref.:	UC_11_I	

Interoperability Test Description		
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 using any user identity • IMS_B is configured to contact AS_B (CFU) for userCFU • UE_B1 is subscribed to IMS_B 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
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 an access-network-charging-info_parameter and* * not containing a term-ioi_parameter) and* * containing a Record-Route_header* * indicating the originating S-CSCF_SIP_URI }* *}*
	2	TP_IMS_5108_03 in CFW step 6 (INVITE) *ensure that {* * when { IMS_B receives an initial INVITE from IMS_A addressed_to UE_B }* * then { IMS_B sends the initial 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 IMS_B and* * containing a P-Charging-Vector_header* * including a orig-ioi_parameter* * indicating operator_identifier of IMS_A and* * not including a term-ioi_parameter }* *}*
	3	TP_IMS_5115_08 in CFW step 20 & 21 (200 OK) *ensure that {* * when { IMS_B receives 200_response from AS_B addressed_to UE_A }* * then { IMS_B 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 IMS_BIUT_ }* *}*

Step	Direction							Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IMS B	AS B		
1	→→→								User A calls User B

Step	Direction							Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IMS B	AS 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 UE_B2
15								100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
16									User B2 is informed of incoming call of User A
17									User B2 answers call
18								200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
19								200 OK	IMS_B forwards 200 OK response to AS_B
20								**200 OK**	**AS_B returns, possibly modified, 200 OK to IMS_B**
21								**200 OK**	**IMS_B forwards 200 OK response to IMS_A**
22								200 OK	IMS_A forwards 200 OK response to UE_A
23									User A is informed that call has been answered

4.5.5.8 Supplementary Service CFU with AS in roaming

Interoperability Test Description		
Identifier:	TD_IMS_SS_0008	
Summary:	IMS network supports properly application services based on the example of the CFU supplementary service.	
Configuration:	CF_ROAM_AS	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5046_01	TS 124 229 [1], clause 5.2.6.3 ¶5
	TP_IMS_5067_01	TS 124 229 [1], clause 5.2.7.2 ¶7
	TP_IMS_5070_01	TS 124 229 [1], clause 5.2.7.3 ¶6
	TP_IMS_5110_01	TS 124 229 [1], clause 5.4.3.3 ¶33
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_A is configured to contact AS_A (CFU) for userCFU • UE_A1 is subscribed to IMS_A and has activated CFU service	
Test Sequence:	**Step**	
	1	User B calls User A (i.e. userCFU in IMS_A)
	2	User B may be informed of call diversion
	3	User A2 answers call
	4	Verify that user B is informed that call has been answered
	6	Verify that user A2 is informed that call is established
	7	User B ends call
	8	Verify that user A2 is informed that call has ended
	9	Verify that user B is informed that call has ended
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 a Route_header* * not indicating the P-CSCF_SIP_URI of IMS_A and* * containing a Route_header* * indicating the "list of Service Route header URIs* * from the registration" 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 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* * not containing P-Preferred-Identity_header and* * containing a P-Asserted-Identity_header* * containing an address of UE_B 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* * }* *}*

		Interoperability Test Description

	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 & 24 (200 OK)
		ensure that {
		  when { IMS_A receives a 200_response from AS_A addressed_to UE_B }
		  then { IMS_A sends the 200_response to IMS_B }
		}

Step	Direction							Message	Comment
	User A2	UE A2	User B	UE B	IMS A	IMS B	AS A		
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 INVITE to IMS_A**
7					→			100 Trying	IMS_A responds with a 100 Trying provisional response
									INVITE triggers the CFU IFC in IMS_A
8					→			INVITE	IMS_A forwards the INVITE to IMS_A AS
9					←			100 Trying	IMS_A AS optionally responds with the 100 Trying to IMS_A
									IMS_A AS applies the CDIV CFU procedure
10					←			181 Call is being forwarded	IMS_A AS indicates optionally to IMS_A that call has been forwarded
11					→			181 Call is being forwarded	IMS_A indicates to IMS_B that call has been forwarded
12					←			181 Call is being forwarded	IMS_B indicates to IMS_A that call has been forwarded
13				←				181 Call is being forwarded	IMS_A indicates to UE_B that call to UE_A has been forwarded
14			←						User B may be informed of call diversion
15					←			INVITE	IMS_A AS returns modified INVITE including new request URI and history header to IMS_A
16					→			100 Trying	IMS_A responds with a 100 Trying provisional response
17		←						INVITE	IMS_A forwards the INVITE to UE_A2
18		→						100 Trying	UE_A2 optionally responds with a 100 Trying provisional response
19	←								User A2 is informed of incoming call of User B
20	→								User A2 answers call
21		→						200 OK	UE_A2 responds to INVITE with 200 OK to indicate that the call has been answered

Step	Direction							Message	Comment
	User A2	UE A2	User B	UE B	IMS A	IMS B	ASA		
22						→		200 OK	IMS_A forwards 200 OK response to IMS_A AS
23					←			**200 OK**	**IMS_A AS returns, possibly modified, 200 OK to IMS_A**
24					→			**200 OK**	**IMS_A forwards 200 OK response to IMS_B**
25					←			200 OK	IMS_B forwards 200 OK response to IMS_A
26				←				200 OK	IMS_A forwards 200 OK response to UE_B
27			←						User B is informed that call has been answered

4.5.5.9   Supplementary Services OIP and OIR with AS

Interoperability Test Description		
Identifier:	TD_IMS_SS_0009	
Summary:	IMS network supports properly application services based on the example of the OIP and OIR supplementary services.	
Configuration:	CF_INT_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_01	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_09_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 userOIR_priv identity according to table 1 • UE_B is registered in IMS_B using userOIP_priv identity according to table 1 • IMS_A is configured to contact AS_A (OIR) • UE_A is subscribed to OIR service • 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 and User A's identity is not displayed
	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 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_5097_01 in CFW step 8 (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 an access-network-charging-info_parameter and* *not containing a term-ioi_parameter) and* *containing a Record-Route_header* *indicating the originating S-CSCF_SIP_URI }* *}*
	2	TP_IMS_5108_03 in CFW step 10 (INVITE) *ensure that {* *when {IMS_B receives an initial INVITE from IMS_A addressed_to UE_B}* *then {IMS_B 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 IMS_B and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*

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_B
7					→→				100 Trying	IMS_A responds with a 100 Trying provisional response
8					→→→→→				**INVITE**	**IMS_A forwards the INVITE to IMS_B**
9					←←←←←				100 Trying	IMS_B responds with a 100 Trying provisional response
										INVITE triggers the OIP IFC in IMS_B
10							→→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
11							←←		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
12							←←		INVITE	IMS_B AS returns modified INVITE including modified From and P-Asserted headers to IMS_B
13							→→		100 Trying	IMS_B responds with a 100 Trying provisional response
14				←←←←←←←←					INVITE	IMS_B forwards the INVITE to UE_B

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
15					→		→		100 Trying	UE_B optionally responds with a 100 Trying provisional response
16			←							User B is informed of incoming call of User A, user A's identity is not displayed
17				→			→		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
18							→	→	180 Ringing	IMS_B forwards the 180 Ringing to IMS_B AS
19							←		180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing to IMS_B
20					←				180 Ringing	IMS_B forwards 180 Ringing response to IMS_A
21					→	→			180 Ringing	IMS_A forwards 180 Ringing response to IMS_A AS
22					←				180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing response to IMS_A
23			←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
24	←									User A is informed that UE_B is ringing
25			→							User B answers call
26				→			→		200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
27							→	→	200 OK	IMS_B forwards the 200 OK to IMS_B AS
28							←		200 OK	IMS_B AS forwards, possibly modified, 200 OK to IMS_B
29					←				200 OK	IMS_B forwards 200 OK response to IMS_A
30					→	→			200 OK	IMS_A forwards 200 OK response to IMS_A AS
31					←				200 OK	IMS_A AS forwards, possibly modified, 200 OK response to IMS_A
32			←						200 OK	IMS_A forwards the 200 OK response to UE_A
33	←									User A is informed that call has been answered

4.5.5.10 Supplementary Services OIP and OIR with AS in roaming

Interoperability Test Description		
Identifier:	TD_IMS_SS_0010	
Summary:	IMS network supports properly application services based on the example of the OIP and OIR supplementary services.	
Configuration:	CF_ROAM_AS	
SUT	IMS_A and IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5046_01	TS 124 229 [1], clause 5.2.6.3 ¶5
	TP_IMS_5097_09	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5308_01	TS 124 229 [1], clause 5.4.4.2.2 ¶2
	TP_IMS_5308_02	TS 124 229 [1], clause 5.4.4.2.2 ¶2
	TP_IMS_5067_01	TS 124 229 [1], clause 5.2.7.2 ¶7
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_A (OIP) • UE_A is subscribed to OIP service • IMS_B is configured to contact AS_B (OIR) • UE_B is subscribed to OIR service	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User B calls User A (i.e. userOIP 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
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 a Route_header* *not indicating the P-CSCF_SIP_URI of IMS_A and* *containing a Route_header* *indicating the "list of Service Route header URIs* *from the registration" 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 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* *not containing P-Preferred-Identity_header and* *containing a P-Asserted-Identity_header* *containing an address of UE_B and* *containing a P-Charging-Vector_header* *containing an icid_parameter }* *}*
	2	TP_IMS_5097_09 in CFW step 6 (INVITE) *ensure that {* *when { IMS_B receives an initial INVITE from IMS_A addressed_to UE_B }* *then { IMS_B 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 and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*
	3	TP_IMS_5308_01 in CFW step 20 (180 ringing) *ensure that {* *when { IMS_A receives a 180 response from UE_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *then { IMS_A sends the 180 response to AS_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}*
	3	TP_IMS_5308_02 in CFW step 30 (200 OK) *ensure that {* *when { IMS_A receives a 200 response from UE_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *then { IMS_A sends the 200 response to AS_A* *containing a P-Charging-Vector_header*

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		including an access-network-charging-info_parameter }

	4	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
		    }
		}

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

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS 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
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

4.5.5.11 Ad-hoc Conference Call service

Interoperability Test Description	
Identifier:	TD_IMS_CONF_0001
Summary:	IMS network handles subsequent INVITEs, UPDATEs, REFERs and NOTIFYs correctly during Ad-Hoc Conference calls.
Configuration:	CF_INT_CONF_ALL
SUT	IMS_A
References	Test Purpose Specification Reference
	TP_IMS_5121_02 TS 124 229 [1], clause 5.4.3.3 ¶53
Use Case ref.:	UC_16
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 • IMS_A is configured to contact AS_A (CONF) • UE_B is registered in IMS_B using any user identity • IMS_B is configured to contact AS_B (CONF) • User A and B are subscribed to CONF service • User A is pre-provisioned with conference-factory URI in IMS A

Test Sequence:	Step	
	1	User A initiates an ad-hoc conference call with a pre-configured conference-factory URI
	2	Verify that User A is informed the Ad Hoc Conference Call is being set up
	3	Verify that User A is informed the Ad Hoc Conference Call is established
	4	User A invites User B to join the Conference Call.
	5	Verify that User B is informed of incoming invitation from User A to join the Conference Call
	6	Verify that User A is informed that User B is being alerted
	7	User B joins the Conference Call
	8	Verify that User A is alerted when User B joins the Conference Call
	9	User B leaves the Conference Call
	10	Verify that User B is informed that the Conference Call has ended
	11	Verify that User A is alerted when User B leaves the Conference Call

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5121_02 in CFW in step 36 & 37 (200 OK): *ensure that {* *when { UE_B sends a 1xx or 2xx_response to UE_A }* *then { IMS_A receives the 1xx or 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**	**User B**	**UE B**	**IMS A**	**AS A**	**IMS B**	**AS B**		
1	→									User A initiates an ad-hoc conference call
2			→						INVITE	UE_A sends INVITE to IMS_A with information for all commonly supported presence elements
3			←						100 Trying	IMS_A responds with a 100 Trying provisional response
4	←									User A is informed the Ad Hoc Conference Call is being set up
5					→				INVITE	IMS_A forwards INVITE to IMS_A AS
6					←				100 Trying	IMS_A AS responds with a 100 Trying provisional response
7					←				200 OK	IMS_A AS responds with a 200 OK to IMS_A, with isfocus parameter.
8		←							200 OK	IMS_A forwards the 200OK response to UE_A
9	←									User A is informed the Ad Hoc Conference Call is established
10			→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→				ACK	IMS_A forwards the ACK to IMS_A AS
12	→									User A invites user B to join the ad-hoc conference call
13			→						REFER	UE_A sends REFER message to IMS_A, with Refer-To : <UE_B uri ;method=INVITE>
14					→				REFER	IMS_A forwards the REFER to IMS_A AS
15					←				202 Accepted	IMS_A AS responds with a 202 Accepted
16		←							202 Accepted	IMS_A forwards the 202 Accepted response to UE_A
17					←				NOTIFY	IMS_A AS sends a NOTIFY to IMS_A to inform the conference initiator the REFER message is being processed
18		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
19			→						200 OK	UE_A responds with 200 OK to IMS_A
20					→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
21					←				INVITE	IMS_A AS sends INVITE to UE_B with conference-factory URI (received in the REFER message from UE A)
22					→				100 Trying	IMS_A responds with a 100 Trying provisional response
23							→		INVITE	IMS_A forwards the INVITE to IMS_B
24							←		100 Trying	IMS_B responds with a 100 Trying provisional response
25				←					INVITE	IMS_B forwards the INVITE to UE_B

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
26									100 Trying	UE_B responds with a 100 Trying provisional response
27										User B is informed of incoming invitation from User A to join the Conference Call
28									180 Ringing	UE_B sends a 180 ringing to IMS_B
29									180 Ringing	IMS_B forwards the 180 ringing to IMS_A
30									180 Ringing	IMS_A forwards the 180 ringing to IMS_A AS
31									NOTIFY	Upon reception of 180 Ringing from UE_B, IMS_A AS sends NOTIFY with sipfrag: 180 Ringing to inform conference initiator that UE_B is being invited to join the conference
32									NOTIFY	IMS_A forwards the NOTIFY to UE_A
33										User A is notified that User B is being invited to join the call
34									200 OK	UE_A responds with 200 OK to IMS_A for NOTIFY
35									200 OK	IMS_A forwards the 200 OK response to IMS_A AS
36									**200 OK**	**UE_B responds with 200 OK to IMS_B for INVITE**
37									**200 OK**	**IMS B forwards the 200 OK response to IMS A**
38									200 OK	IMS A forwards the 200 OK response to IMS_A AS
39										User B joins the conference
40									ACK	UE_B acknowledges the 200 OK for INVITE
41									ACK	IMS B forwards the ACK to IMS A
42									ACK	IMS A forwards the ACK to IMS_A AS
43									NOTIFY	AS_A sends NOTIFY to UE_A to inform it has successfully joined the conference
44									NOTIFY	IMS_A forwards NOTIFY to UE_A
45										User A is alerted that User B has joined the conference
46									200 OK	UE_A sends 200 OK response for NOTIFY
47									200 OK	IMS_A forwards the 200 OK response to IMS_A AS
48										User B leaves the conference
49									BYE	UE_B sends BYE to IMS_B to leave the conference
50									BYE	IMS_B forwards the BYE to IMS_A
51									BYE	IMS_A forwards the BYE to IMS_A AS
52									200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK response for BYE
53									200 OK	IMS_A forwards the 200 OK response to IMS_B
54									200 OK	IMS_B forwards the 200 OK response to UE_B
55										User B is informed that the conference has ended
56									NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the conference
57									NOTIFY	IMS_A forwards NOTIFY to UE_A
58										User A is notified that user B has left the conference
59									200 OK	UE_A sends a 200 OK response for NOTIFY

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
60					→→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS

4.5.6   Presence

4.5.6.1   Watcher subscription for presence event notification in visited network

Interoperability Test Description		
Identifier:	TD_IMS_PRES_0001	
Summary:	IMS network supports properly presence service when a watcher subscribes to presence information for a presentity that it's located in a different network.	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_13	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_06	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶65
Use Case ref.:	UC_17_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 userPRES according to table 1 • UE_B is registered in IMS_B via IMS A using userPRES according to table 1 • UE_A is configured to receive notifications with watcher information • IMS_A is configured to contact AS_A • IMS_B is configured to contact AS_B • AS_Bis configured for reactive autorization • IMS_A is within the trust domain of IMS_B • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User B publishes presence information
	2	User B is informed of its presence status update
	3	User A subscribes to presence information from User B
	4	User B receives an authorization request from User A to see its own presence information
	5	User B authorizes user A to be informed of its own presence information
	6	User A is informed of User B presence information
Conformance Criteria:	**Check**	

	1	TP_IMS_5097_13 in CFW step 4 (PUBLISH):
		ensure that {
		  when {IMS_B receives a PUBLISH from IMS_A }
		  then { IMS_B sends the PUBLISH to AS_B
		       containing a Route_header
		        indicating the SIP_URI of AS_B and
		       containing a P-Charging-Function-Addresses_header and
		       containing a P-Charging-Vector_header
		         containing an orig-ioi parameter indicating IMS_A and
		          not containg a term-ioi parameter}
		}

	2	TP_IMS_5108_06 in CFW step 11 & 12 (SUBSCRIBE):
		ensure that {
		when { IMS_A receives a SUBSCRIBE addressed to UE_B }
		  then { IMS_B sends the SUBSCRIBE to AS_B
		       containing a topmost Route header
		          indicating the SIP URI of AS_B

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		containing a Route header
		   indicating the S-CSCF_SIP URI of IMS_B
		  containing a P-Charging-Vector_header
		   containing an orig-ioi parameter indicating IMS_A and
		   not containg a term-ioi parameter}
		 }
		}

	3	TP_IMS_5115_08 in CFW step 13 & 14 (200 OK):
		ensure that {
		when { AS_B sends a 200 response to UE_A }
		 then { IMS_B receives the 200 response
		   containing a P-Charging-Vector_header
		    containing a orig-ioi_parameter indicating IMS_A and
		    containing a term-ioi_parameter indicating IMS_B }
		}

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1			→→							User B publishes presence information
2				→→					PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3					→→				PUBLISH	IMS_A forwards the PUBLISH to IMS_B
4							→→		**PUBLISH**	**IMS_B forwards the PUBLISH to IMS_B AS (PS)**
5							←←		200 OK	IMS_B AS responds with a 200 OK to IMS_B
6					←←				200 OK	IMS_B forwards the 200 OK response to IMS_A
7				←←					200 OK	IMS_A forwards the 200 OK response to UE_B
8			←←							User B is informed of its presence status update
9	→→									User A subscribes to presence information from User B
10					→→				SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A
11							→→		**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to IMS_B**
12								→→	**SUBSCRIBE**	**IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)**
13							←←		**200 OK**	**IMS_B AS responds with a 200 OK to IMS_B**
14					←←				**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
15		←←							200 OK	IMS_A forwards the 200 OK response to UE_A
16					←←				NOTIFY	IMS_B AS sends NOTIFY to IMS_A
17		←←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
18					→→				200 OK	UE_A responds with a 200 OK to IMS_A
19							→→		200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										SUBSCRIPTION triggers the AS to send a NOTIFY to UE_B indicating the change to the watcher information subscriber
20							←←		NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B the change to the watcher information subscriber
21					←←				NOTIFY	IMS_B forwards the NOTIFY to IMS_A
22				←←					NOTIFY	IMS_A forwards the NOTIFY to UE_B
23				→→					200 OK	UE_B responds with a 200 OK to IMS_A

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
24					→→				200 OK	IMS_A forwards the 200 OK response to IMS_B
25							→→		200 OK	IMS_B forwards the 200 OK response to IMS_B AS
26				←						User B receives an authorization request from User A to see its own presence information

4.5.6.2   Watcher subscription to presence event notification in home network

Interoperability Test Description		
Identifier:	TD_IMS_PRES_0002	
Summary:	IMS network supports properly presence service when a watcher subscribes to presence information for a presentity that it's located in a different network.	
Configuration:	CF_INT_AS	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_06	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶65
Use Case ref.:	UC_17_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 userPRES according to table 1 • UE_B is registered in IMS_B using userPRES according to table 1 • UE_B is configured to receive notifications with watcher information • AS_B is configured for reactive authorization • IMS_A is configured to contact AS_A (PS) • IMS_A is within the trust domain of IMS_B • IMS_A not configured for topology hiding

Test Sequence:	**Step**	
	1	User B publishes presence information
	2	User B is informed of its presence status update
	3	User A subscribes to presence information from User B
	4	User B receives an authorization request from User A to see its own presence information
	5	User B authorizes user A to be informed of its own presence information
	6	User A is informed of User B presence information

Conformance Criteria:	**Check**	
	1	TP_IMS_5108_06 in CFW step 9 & 10 (SUBSCRIBE): *ensure that {* *when { IMS_A receives a SUBSCRIBE addressed to UE_B }* * then { IMS_B sends the SUBSCRIBE to AS_B* *containing a topmost Route header* *indicating the SIP URI of AS_B* *containing a Route header* *indicating the S-CSCF_SIP URI of IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi parameter indicating IMS_A and* *not containing a term-ioi parameter}* *}* *}*

		Interoperability Test Description
	2	TP_IMS_5115_08 in CFW step 11 & 12 (200 OK):
		ensure that {
		when { AS_B sends a 200 response to UE_A }
		then { IMS_B receives the 200 response
		containing a P-Charging-Vector_header
		containing a orig-ioi_parameter indicating IMS_A and
		containing a term-ioi_parameter indicating IMS_B }
		}

Step	Direction								Message	Comment
	User A	**UE A**	**User B**	**UE B**	**IMS A**	**AS A**	**IMS B**	**AS B**		
1			→							User B publishes presence information
2				→					PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3							→		PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
4							←		200 OK	IMS_B AS responds with a 200 OK to IMS_B
5				←					200 OK	IMS_B forwards the 200 OK response to UE_B
6			←							User B is informed of its presence status update
7	→									User A subscribes to presence information from User B
8					→				SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A
9							→		**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to IMS_B**
10							→		**SUBSCRIBE**	**IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)**
11							←		**200 OK**	**IMS_B AS responds with a 200 OK to IMS_B**
12					←				**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
13		←							200 OK	IMS_A forwards the 200 OK response to UE_A
14					←				NOTIFY	IMS_B AS sends NOTIFY to IMS_A
15		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
16				→					200 OK	UE_A responds with a 200 OK to IMS_A
17							→		200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										SUBSCRIPTION triggers the AS to send a NOTIFY to UE_B indicating the change to the watcher information subscriber
18							←		NOTIFY	IMS_B AS sends NOTIFY to IMS_B to indicate UE_B the change to the watcher information subscriber
19				←					NOTIFY	IMS_B forwards the NOTIFY to UE_B
20				→					200 OK	UE_B responds with a 200 OK to IMS_B
21							→		200 OK	IMS_B forwards the 200 OK response to IMS_B AS
22			←							User B receives an authorization request from User A to be informed of its own presence information

4.5.6.3 Unsuccessful watcher subscription to presence event notification in home network

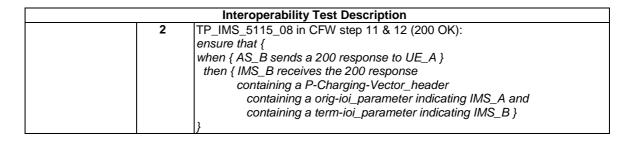| Interoperability Test Description		
Identifier:	TD_IMS_PRES_0003	
Summary:	IMS network supports properly presence service when a watcher subscribes to presence information for a presentity that it's located in a different network and does not authorize the watcher to be informed of his presence information.	
Configuration:	CF_INT_AS	
SUT	IMS_B	
References	Test Purpose	Specification Reference
	TP_IMS_5108_06	TS 124 229 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_17_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 userPRES according to table 1 • UE_B is registered in IMS_B using userPRES according to table 1 • UE_A is not authorized to see the presence of UE_B • IMS_B is configured to contact AS_B (PS) • IMS_A is within the trust domain of IMS_B • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A subscribes to presence information from User B
	2	User A is not informed of User B presence information
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_06 in CFW step 3 & 4 (SUBSCRIBE): *ensure that {* *when { IMS_A receives a SUBSCRIBE addressed to UE_B }* * then { IMS_B sends the SUBSCRIBE to AS_B* * containing a topmost Route header* * indicating the SIP URI of AS_B* * containing a Route header* * indicating the S-CSCF_SIP URI of IMS_B* * containing a P-Charging-Vector_header* * containing an orig-ioi parameter indicating IMS_A and* * not containg a term-ioi parameter}* * }* *}*

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1	→→→									User A subscribes to presence information from User B
2		→→→→→→							SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A
3			→→→→→→						**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to IMS_B**
4					→→→→→→				**SUBSCRIBE**	**IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)**
5							←←←←←←		2xx or 4xx response	IMS_B AS responds with a 200 OK to IMS_B
6					←←←←←←				2xx or 4xx response	IMS_B AS responds with a 200 OK to IMS_A
7		←←←←←←							2xx or 4xx response	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	ASA	IMS B	ASB		
	←——									User A is not informed of User B presence information

4.5.6.4 Watcher subscription to resource list in visited network.

Interoperability Test Description	
Identifier:	TD_IMS_PRES_0004
Summary:	IMS network supports properly presence service when a watcher subscribes to a resource list containing one or more presentities located in different networks.
Configuration:	CF_ROAM_AS
SUT	IMS_B

References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_13	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5108_06	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5313_01	TS 124 229 [1], clause 5.4.6.1.3 ¶2

Use Case ref.:	UC_18_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 userPRES according to table 1 • UE_B is registered in IMS_B via IMS A using userPRES according to table 1 • UE_A is authorized to see UE_B presence information • UE_A is authorized to use the resource list userPRES_list: • IMS_A is within the trust domain of IMS_B • IMS_B is configured to contact AS_B (PS) • IMS_A, IMS_B not configured for topology hiding

Test Sequence:	**Step**	
	1	User B publishes presence information
	2	User B is informed of its presence status update
	3	User A subscribes to resource list userPRES_list containing UserB SIP URI
	4	User A sees User B presence information

Conformance Criteria:	**Check**	
	1	TP_IMS_5097_13 in CFW step 4 (PUBLISH): *ensure that {* *when {IMS_B receives a PUBLISH from IMS_A }* *then { IMS_B sends the PUBLISH to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header and* *containing a P-Charging-Vector_header* *containing an orig-ioi parameter indicating IMS_A and* *not containing a term-ioi parameter}* *}*
	2	TP_IMS_5108_06 in CFW step 19 & 20 (SUBSCRIBE): *ensure that {* *when { IMS_A receives a SUBSCRIBE addressed to UE_B }* *then { IMS_B sends the SUBSCRIBE to AS_B* *containing a topmost Route header* *indicating the SIP URI of AS_B* *containing a Route header* *indicating the S-CSCF_SIP URI of IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi parameter indicating IMS_A and* *not containing a term-ioi parameter}* *}* *}*

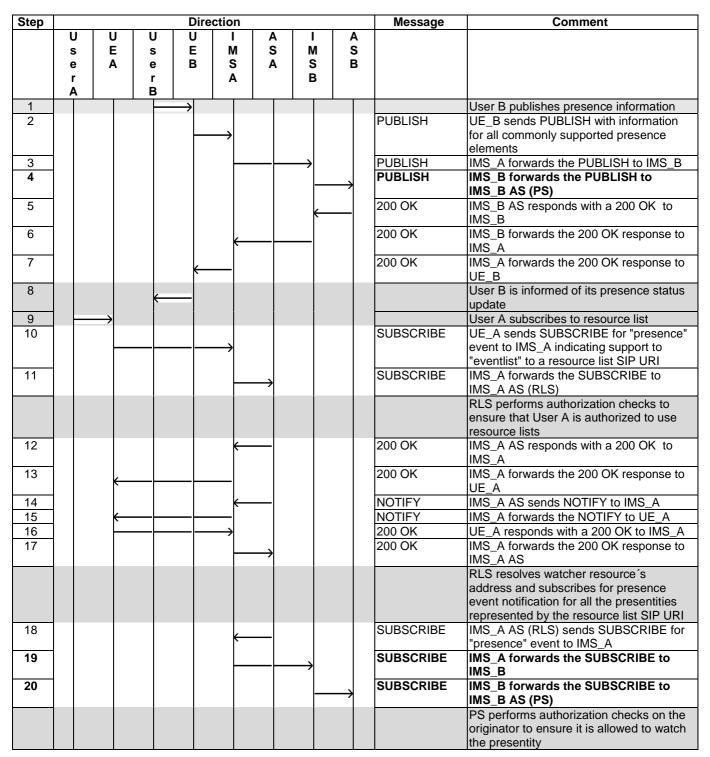|		Interoperability Test Description

	3	TP_IMS_5313_01 in CFW step 22 & 23 (200 OK)
		ensure that {
		  when { IMS_A receives a response from IMS_B
		      containing a P-Charging-Vector_header
		        including an access-network-charging-info_parameter
		  }
		  then { IMS_A sends the response to AS_A
		      containing a P-Charging-Vector_header
		        including an access-network-charging-info_parameter
		    }
		}

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1				→→						User B publishes presence information
2					→→				PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3					→—		→→		PUBLISH	IMS_A forwards the PUBLISH to IMS_B
4							→—	→→	**PUBLISH**	**IMS_B forwards the PUBLISH to IMS_B AS (PS)**
5							←—	←←	200 OK	IMS_B AS responds with a 200 OK to IMS_B
6					←—		←←		200 OK	IMS_B forwards the 200 OK response to IMS_A
7				←—	←←				200 OK	IMS_A forwards the 200 OK response to UE_B
8			←←	←—						User B is informed of its presence status update
9	→→	→—								User A subscribes to resource list
10					→→				SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A indicating support to "eventlist" to a resource list SIP URI
11					→→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_A AS (RLS)
										RLS performs authorization checks to ensure that User A is authorized to use resource lists
12					←←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
13		←←			←—				200 OK	IMS_A forwards the 200 OK response to UE_A
14					←←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
15		←←			←—				NOTIFY	IMS_A forwards the NOTIFY to UE_A
16		→→			→→				200 OK	UE_A responds with a 200 OK to IMS_A
17					→→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
										RLS resolves watcher resource´s address and subscribes for presence event notification for all the presentities represented by the resource list SIP URI
18					←←				SUBSCRIBE	IMS_A AS (RLS) sends SUBSCRIBE for "presence" event to IMS_A
19					→—		→→		**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to IMS_B**
20							→—	→→	**SUBSCRIBE**	**IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)**
										PS performs authorization checks on the originator to ensure it is allowed to watch the presentity

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
21							←		200 OK	IMS_B AS (PS) responds with a 200 OK to IMS_B
22					←				**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
23					→				**200 OK**	**IMS_A forwards the 200 OK response to IMS_A AS (RLS)**
24					←				NOTIFY	IMS_B AS sends a NOTIFY to IMS_A with the presence information of UE_B
25					→				NOTIFY	IMS_A forwards the NOTIFY to IMS_A AS (RLS)
26					←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
27					→				200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										RLS notifies with presence information for all the presentities represented by the resource list SIP URI
28					←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
29		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
30		→							200 OK	UE_A responds with a 200 OK to IMS_A
31					→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
32	←									User A sees user B presence information

4.5.6.5 Watcher subscription to resource list in home network

Interoperability Test Description		
Identifier:	TD_IMS_PRES_0005	
Summary:	IMS network supports properly presence service when a watcher subscribes to a resource list containing one or more presentities located in different networks.	
Configuration:	CF_INT_AS	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_06	TS 124 229 [1], clause 5.4.3.3 ¶1
	TP_IMS_5313_01	TS 124 229 [1], clause 5.4.6.1.3 ¶2
Use Case ref.:	UC_18_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 userPRES according to table 1 - UE_B is registered in IMS_B using userPRES according to table 1 - UE_A is authorized to see UE_B presence information - UE_A is authorized to use the resource list userPRES_list: - IMS_A is within the trust domain of IMS_B - IMS_A is configured to contact AS_A (RLS) - IMS_B is configured to contact AS_B (PS) - IMS_A, IMS_B not configured for topology hiding	
Test Sequence:	**Step**	
	1	User B publishes presence information
	2	User B is informed of its presence status update
	3	User A subscribes to resource list containing User B SIP URI
	4	User A sees User B presence information

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_06 in CFW step 17 & 18 (SUBSCRIBE): *ensure that {* *when { IMS_A receives a SUBSCRIBE addressed to UE_B }* * then { IMS_B sends the SUBSCRIBE to AS_B* * containing a topmost Route header* * indicating the SIP URI of AS_B* * containing a Route header* * indicating the S-CSCF_SIP URI of IMS_B* * containing a P-Charging-Vector_header* * containing an orig-ioi parameter indicating IMS_A and* * not containg a term-ioi parameter}* * }* *}*
	2	TP_IMS_5313_01 in CFW step 20 & 21 (200 OK) *ensure that {* * when { IMS_A receives a response from IMS_B* * containing a P-Charging-Vector_header* * including an access-network-charging-info_parameter* * }* * then { IMS_A sends the response to AS_A* * containing a P-Charging-Vector_header* * including an access-network-charging-info_parameter* * }* *}*

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1				→						User B publishes presence information
2							→		PUBLISH	UE_B sends PUBLISH with information for all commonly supported presence elements
3							→		PUBLISH	IMS_B forwards the PUBLISH to IMS_B AS (PS)
4							←		200 OK	IMS_B AS responds with a 200 OK to IMS_B
5				←					200 OK	IMS_B forwards the 200 OK response to UE_B
6			←							User B is informed of its presence status update
7	→									User A subscribes to resource list
8					→				SUBSCRIBE	UE_A sends SUBSCRIBE for "presence" event to IMS_A indicating support to "eventlist" to a resource list SIP URI
9						→			SUBSCRIBE	IMS_A forwards the SUBSCRIBE to IMS_A AS (RLS)
										RLS performs authorization checks to ensure that User A is authorized to use resource lists
10					←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
11		←							200 OK	IMS_A forwards the 200 OK response to UE_A
12					←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
13		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
14					→				200 OK	UE_A responds with a 200 OK to IMS_A
15						→			200 OK	IMS_A forwards the 200 OK response to IMS_A AS

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
										RLS resolves watcher resource´s address and subscribes for presence event notification for all the presentities represented by the resource list SIP URI
16					←				SUBSCRIBE	IMS_A AS (RLS) sends SUBSCRIBE for "presence" event to IMS_A
17					→	→			**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to IMS_B**
18							→		**SUBSCRIBE**	**IMS_B forwards the SUBSCRIBE to IMS_B AS (PS)**
										PS performs authorization checks on the originator to ensure it is allowed to watch the presentity
19							←		200 OK	IMS_B AS (PS) responds with a 200 OK to IMS_B
20					←				**200 OK**	**IMS_B forwards the 200 OK response to IMS_A**
21					→				**200 OK**	**IMS_A forwards the 200 OK response to IMS_A AS (RLS)**
22					←				NOTIFY	IMS_B AS sends a NOTIFY to IMS_A with the presence information of UE_B
23					→				NOTIFY	IMS_A forwards the NOTIFY to IMS_A AS (RLS)
24					←				200 OK	IMS_A AS responds with a 200 OK to IMS_A
25					→		→		200 OK	IMS_A forwards the 200 OK response to IMS_B AS
										RLS notifies with presence information for all the presentities represented by the resource list SIP URI
26					←				NOTIFY	IMS_A AS sends NOTIFY to IMS_A
27		←			←				NOTIFY	IMS_A forwards the NOTIFY to UE_A
28		→			→				200 OK	UE_A responds with a 200 OK to IMS_A
29					→				200 OK	IMS_A forwards the 200 OK response to IMS_A AS
30	←									User A sees user B presence information

4.5.7 IPTV

4.5.7.1 IPTV registration and Service Attachment. Push mode

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0001	
Summary:	IMS network supports properly IPTV registration and service attachment in Push mode.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5206_01	TS 124 229 [1], clause 5.4.1.2.2 ¶7
	TP_IMS_5308_02	TS 124 229 [1], clause 5.4.4.2.2 ¶2
Use Case ref.:		
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using userIPTV according to table 1 • IMS_A is configured to send a third party register to AS_A (SDF) • IMS_A not configured for topology hiding	

Interoperability Test Description		
Test Sequence:	**Step**	
	29	UE receives service attachment information
Conformance Criteria:	**Check**	
	1	TP_IMS_5206_01 in CFW step 23 (REGISTER) *ensure that {* *when { IMS_A receives a protected REGISTER* *containing an Authorization header* *containing a integrity protected parameter indicating yes}* *then { IMS_A sends a third party register to AS_A* *}* *}*
	2	TP_IMS_5308_02 in CFW step 28 (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
	U s e r A	**U E A**	**U s e r B**	**U E B**	**I M S A**	**A S A**	**I M S B**	**A S B**		
										IMS_A matches the iFC of the service profile belong to the user and find out the AS (SDF) that user has subscribed
23					→				**REGISTER**	**IMS_A sends a REGISTER to AS_A (third party registration)**
24					←				200 OK	AS_A responds with 200 OK
25					←				MESSAGE	AS_A sends a MESSAGE containg the service attachment information
26		←							MESSAGE	IMS_A forwards the MESSAGE to UE_A
27		→							200 OK	UE_A responds with 200 OK
28					→				**200 OK**	**IMS_A forwards the 200 OK response to AS_A**
29										UE receives service attachment information

4.5.7.2 IPTV registration and Service Attachment. Pull mode

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0002	
Summary:	IMS network supports properly IPTV registration and service attachment in Pull mode.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5097_09	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5308_02	TS 124 229 [1], clause 5.4.4.2.2 ¶2
Use Case ref.:		
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS A using userIPTV according to table 1 • UE_A, IMS_A, AS_A support pull mode service discovery • IMS_A not configured for topology hiding	

Interoperability Test Description		
Test Sequence:	**Step**	
	31	UE receives service attachment information
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_09 in CFW step 24 (SUBSCRIBE): *ensure that {* *when { IMS_A sends the SUBSCRIBE to AS_A }* *then { AS_A receives the SUBSCRIBE* *containing a Route_header* *indicating the SIP_URI of AS_A* *containing a P-Charging-Function-Addresses_header* *containing a P-Charging-Vector_header* *(containing a orig-ioi_parameter indicating IMS_A and* *not containing a term-ioi_parameter)}* *}*
	2	TP_IMS_5308_02 in CFW step 30 (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	**UE A**	**User B**	**UE B**	**IMS A**	**AS A**	**IMS B**	**AS B**		
										UE retrieves the PSI/address of AS_A (SDF)
23				→					SUBSCRIBE	UE_A sends a SUBSCRIBE for "ua-profile" event to IMS_A
24					→				**SUBSCRIBE**	**IMS_A forwards the SUBSCRIBE to AS_A**
25					←				200 OK	AS_A responds with 200OK
26		←							200 OK	IMS_A forwards the 200 OK response to UE_A
27					←				NOTIFY	AS_A sends a NOTIFY for the service attachment information to IMS_A
28		←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
29				→					200 OK	UE_A responds with 200 OK
30					→				**200 OK**	**IMS_A forwards the 200 OK response to AS_A**
31										UE receives service attachment information

4.5.7.3 BC session

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0003	
Summary:	IMS network supports properly IPTV Broadcast session.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
Use Case ref.:	UC_19	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS A using userIPTV according to table 1 • UE_A has done IPTV registration and service attachment procedures using push or pull mode • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A initiates a BC session
	11	User A receives the broadcast content
	12	User A terminates the session
	19	User A is informed that session is terminated
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_03 in CFW step 3 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A}* *then { IUT sends the initial INVITE to AS_A* *containing a topmost Route_header* *indicating the SIP_URI of AS_A and* *containing a Route_header* *indicating the S-CSCF SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*
	2	TP_IMS_5107_02 in CFW step 7 (ACK) *ensure that {* *when { UE_A sends ACK to addressed to UE_B}* *then { IMS_B receives the ACK* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and and* *not 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 initiates a BC session
2		→							INVITE	UE_A sends a INVITE to IMS_A
3					→				**INVITE**	**IMS_A forwards the INVITE to AS_A**
4					←				200 OK	AS_A responds with 200 OK
5		←							200 OK	IMS_A forwards the 200 OK response to UE_A
6				→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
7					→				**ACK**	**IMS_A forwards the ACK to AS_A**
8	←									User A receives the broadcast content
9	→									User A terminates the session
10				→					BYE	UE_A sends a BYE to IMS_A
11					→				BYE	IMS_A forwards the BYE to AS_A
12					←				200 OK	AS_A responds with 200 OK
13		←							200 OK	IMS_A forwards the 200 OK response to UE_A
14	←									User A is informed that session is terminated

4.5.7.4 CoD session. Establishing content control channel and content delivery channels using RTSP Method 1

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0004	
Summary:	IMS network supports properly IPTV content on demand session.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	Test Purpose	Specification Reference
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
Use Case ref.:	UC_20	
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS A using userIPTV according to table 1 • UE_A has done IPTV registration and service attachment procedures using push or pull mode • UE_A, IMS_A and AS_A are configured to establish content control channel and content delivery channels using RTSP method 1 • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A initiates a CoD session (content selection)
	26	User A starts receiving the streaming content
	27	User A terminates the session
	36	User A is informed that session is terminated
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_03 in CFW step 3 (INVITE) *ensure that {* * when { IUT receives an initial INVITE from IMS_A}* * then { IUT sends the initial INVITE to AS_A* * containing a topmost Route_header* * indicating the SIP_URI of AS_A and* * containing a Route_header* * indicating the S-CSCF SIP_URI of IMS_A and* * containing a P-Charging-Vector_header* * including a orig-ioi_parameter* * indicating operator_identifier of IMS_A and* * not including a term-ioi_parameter }* *}*
	2	TP_IMS_5107_02 in CFW step 11 (ACK) *ensure that {* *when { UE_A sends ACK to addressed to UE_B}* * then { IMS_B receives the ACK* * not containing a Route_header* * indicating the S-CSCF_SIP_URI of IMS_A and and* * not 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 initiates a CoD session (content selection)
2		→							INVITE	UE_A sends a INVITE to IMS_A
3					→				**INVITE**	**IMS_A forwards the INVITE to AS_A (SCF)**
4					←				INVITE	AS_A forwards the INVITE to IMS_A
5					→				INVITE	IMS_A forwards the INVITE to AS_A (MF)
6					←				200 OK	AS_A (MF) responds with 200 OK
7					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8					←				200 OK	AS_A forwards the 200 OK response to IMS_A
9		←							200 OK	IMS_A forwards the 200 OK response to UE_A
10		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→				**ACK**	**IMS_A forwards the ACK to AS_A (SCF)**
12					←				ACK	AS_A forwards the ACK to IMS_A
13					→				ACK	IMS_A forwards the ACK to AS_A (MF)
										UE_A sets up RTSP with AS_A (MF)
14		→							INVITE	UE_A sends reINVITE message indicating media attribute " a=recvonly "
15					→				INVITE	IMS_A forwards the reINVITE to AS_A (SCF)
16					←				INVITE	AS_A forwards the reINVITE to IMS_A
17					→				INVITE	IMS_A forwards the reINVITE to AS_A (MF)
18					←				200 OK	AS_A (MF) responds with 200 OK
19					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
20					←				200 OK	IMS_B forwards the 200 OK response to IMS_A
21		←							200 OK	IMS_A forwards the 200 OK response to UE_A
22		→							ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
23					→				ACK	IMS_A forwards the ACK to AS_A (SCF)
24					←				ACK	AS_A forwards the ACK to IMS_A
25					→				ACK	IMS_A forwards the ACK to AS_A (MF)
26	←									User A starts receiving the streaming content
27	→									User A terminates the session
28		→							BYE	UE_A sends a BYE to IMS_A
29					→				BYE	IMS_A forwards the BYE to AS_A (SCF)
30					←				BYE	AS_A forwards the BYE to IMS_A
31					→				BYE	IMS_A forwards the BYE to AS_A (MF)
32					←				200 OK	AS_A (MF) responds with 200 OK
33					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
34					←				200 OK	IMS_B forwards the 200 OK response to IMS_A
35		←							200 OK	IMS_A forwards the 200 OK response to UE_A
36	←									User A is informed that session is terminated

4.5.7.5 CoD session. Establishing content control channel and content delivery channels using RTSP Method 2

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0005	
Summary:	IMS network supports properly IPTV content on demand session.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.2 ¶1
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶49
Use Case ref.:	UC_21	
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS A using userIPTV • UE_A has done IPTV registration and service attachment procedures using push or pull mode • UE_A, IMS_A and AS_A are configured to establish content control channel and content delivery channels with RTSP method 2 • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A initiates a CoD session (content selection)
	32	User A starts receiving the streaming content
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_03 in CFW step 3 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A}* *then { IUT sends the initial INVITE to AS_A* *containing a topmost Route_header* *indicating the SIP_URI of AS_A and* *containing a Route_header* *indicating the S-CSCF SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *not including a term-ioi_parameter }* *}*
	2	TP_IMS_5107_02 in CFW step 11 (ACK) *ensure that {* *when { UE_A sends ACK to addressed to UE_B}* *then { IMS_B receives the ACK* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and and* *not 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 initiates a CoD session (content selection)
2		→→							INVITE	UE_A sends a INVITE to IMS_A
3					→→				**INVITE**	**IMS_A forwards the INVITE to AS_A (SCF)**
4					←←				INVITE	AS_A forwards the INVITE to IMS_A
5					→→				INVITE	IMS_A forwards the INVITE to AS_A (MF)
6					←←				200 OK	AS_A (MF) responds with 200 OK
7					→→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8					←←				200 OK	AS_A forwards the 200 OK response to IMS_A
9		←←							200 OK	IMS_A forwards the 200 OK response to UE_A
10		→→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→→				**ACK**	**IMS_A forwards the ACK to AS_A (SCF)**
12					←←				ACK	AS_A forwards the ACK to IMS_A
13					→→				ACK	IMS_A forwards the ACK to AS_A (MF)
14										UE_A starts receiving the streaming content

4.5.7.6 Request for Network PVR offline capture in home network

Interoperability Test Description		
Identifier:	TD_IMS_IPTV_0006	
Summary:	IMS network supports properly N-PVR offline capture requests.	
Configuration:	CF_IPTV	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5108_04	TS 124 229 [1], clause 5.4.3.3 ¶1
Use Case ref.:	UC_22	
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS A using userIPTV according to table 1 • UE_A has done IPTV registration and service attachment procedures using either push or pull mode • IMS_A not configured for topology hiding	
Test Sequence:	**Step**	
	1	User A requests to record a live programme that has not started yet
	6	User A is informed that recording has started
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_04 in CFW step 3 (MESSAGE): *ensure that {* * when { IMS_A receives a MESSAGE from UE_A }* * then { IMS_A sends the MESSAGE to AS_A* * containing a topmost Route_header* * indicating the SIP_URI of AS_A and* * containing a Route_header* * indicating the S-CSCF_SIP_URI of IMS_A}* *}*

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1										User a requests to record a live programme that has not started yet
2									MESSAGE	UE_A sends a MESSAGE to IMS_A
3									**MESSAGE**	**IMS_A forwards the MESSAGE to AS_A**
4									200 OK	AS_A responds with 200 OK
5									200 OK	IMS_A forwards the 200 OK response to UE_A
6										User A is informed that recording has started

History

Document history		
V1.1.1	March 2009	Publication
V2.2.1	March 2009	Publication
V2.3.1	April 2010	Publication