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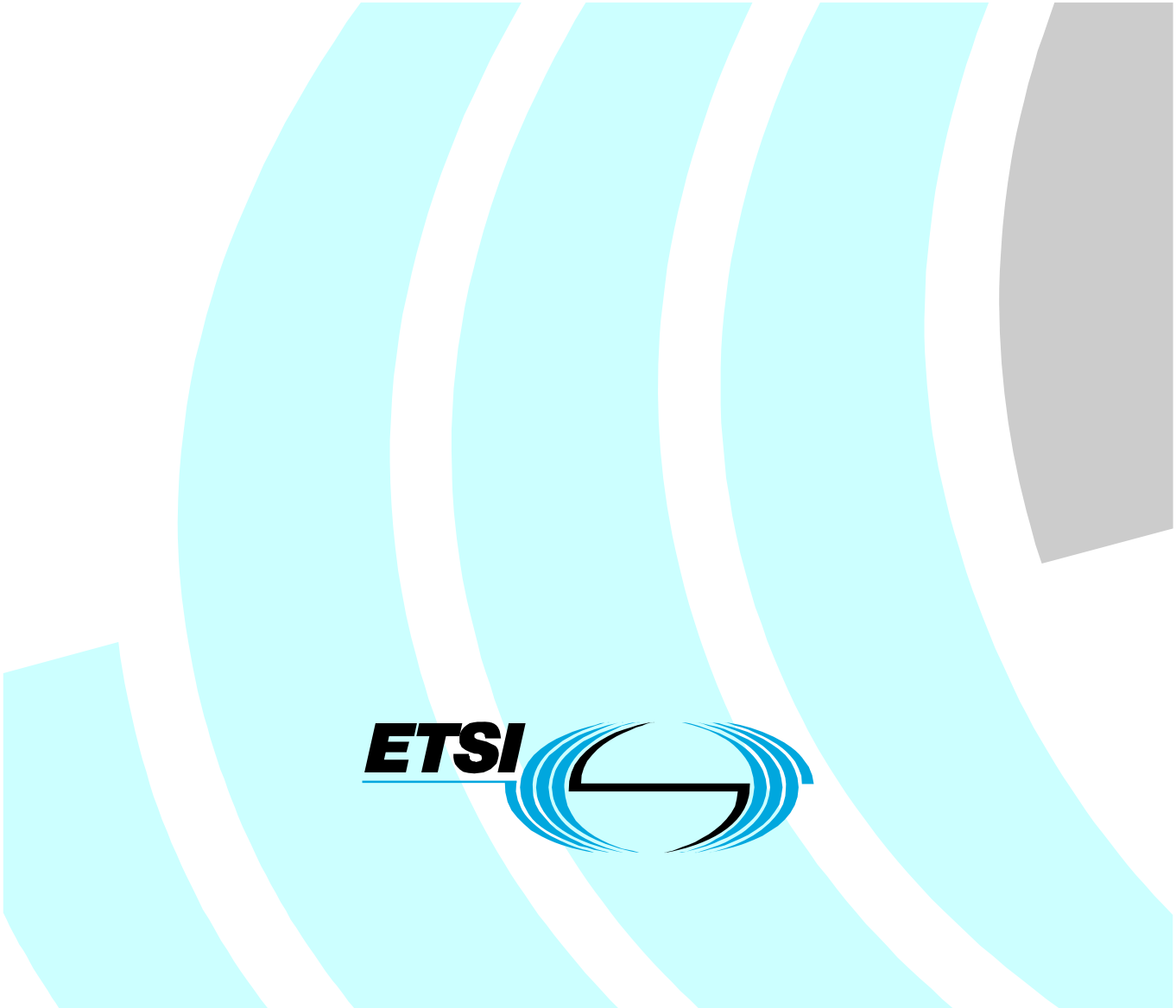
Technical Specification

IMS Network Testing (INT);
IMS NNI Interoperability Test Specifications;
Part 2: Test Descriptions for IMS NNI Interoperability



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Contents

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Foreword

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

The present document is part 2 of a multi-part deliverable covering the IMS NNI Interoperability 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 Inter-IMS Network to Network Interface (II-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]. Interconnection aspects between two different IM CN subsystems for end to end service interoperability are based on standard TS 129 165 [16]. *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 134 229-1 [6].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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 necessary for the application of the present document.

[1] ETSI TS 124 229 (V8.10.0): "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 8.10.0 Release 8)".".

[2] ETSI TS 186 011-1 (V3.1.1): "IMS Network Testing (INT); IMS NNI InteroperabilityTest 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 134 229-1: "Universal Mobile Telecommunications System (UMTS); LTE; Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Part 1: Protocol conformance specification (3GPP TS 34.229-1 Release 8)".

[7] ETSI TS 133 203: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; 3G security; Access security for IP-based services (3GPP TS 33.203 Release 8)".

[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 8)".

[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 124 247: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Messaging service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3 (3GPP TS 24.247 Release 8)".

[16] ETSI TS 129 165: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Inter-IMS Network to Network Interface (NNI) (3GPP TS 29.165 version 8.4.0 Release 8)".

[17] ETSI TS 102 901: "IMS Network Testing (INT); IMS NNI Interoperability Test Specifications; IMS NNI & ISC interoperability test descriptions for RCS".

[18] ETSI TS 129 163 (V8.10.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks (3GPP TS 29.163 version 8.10.0 Release 8)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[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 8)".

[i.2] ETSI TR 123 981: "Universal Mobile Telecommunications System (UMTS); LTE; Interworking aspects and migration scenarios for IPv4-based IP Multimedia Subsystem (IMS) implementations (3GPP TR 23.981 Release 8)".

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
CS	Circuit Switched
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
ISDN	Integrated Service Digital Network
ISUP	ISDN User Part
MGCF	Media Gateway Control Function
MGF	Media Gateway Function
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
MTP	Message Transfer Part
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
SCTP	Stream Control Transmission Protocol
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	eXxtensible Markup Language

4 IMS NNI Interoperability Test Specification

4.1 Introduction

The IMS NNI Interoperability Test Descriptions (TDs) defined in the following clauses are derived from the Test Purposes (TPs) specified in TS 186 011-1 [2]. *The TDs cover both basic call procedures such as call establishment and call release and a selection of the most common supplementary services.*

4.2 Test Prerequisites

4.2.1 IP Version

These test specifications are based on the use of IPv4 for SIP message transport throughout all IMS nodes as specified in TR 123 981 [i.2].

4.2.2 Authentication and Security

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

4.2.3 Registration and Subscription

4.2.3.1 SIP Call Flow

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

4.2.3.1.1 Early IMS Registration and Subscription Call Flow

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

Step	Direction		Message	Comment	
	UE	IMS			
1				The UE establishes an IP bearer as required by its specific access network (optional).	
2	←→			P-CSCF address discovery using DHCP procedures for IPv4 (optional).	
3	→		REGISTER	The UE sends initial registration for IMS services.	Unprotected
4	←		200 OK	The IMS responds with 200 OK.	
5	→		SUBSCRIBE	The UE subscribes to its registration event package.	
6	←		200 OK or 202 Accepted	The IMS responds with 200 OK or 202 Accepted.	
7	←		NOTIFY	The IMS sends initial NOTIFY for registration event package, containing full registration state information for the registered public user identity in the XML body.	
8	→		200 OK	The UE responds with 200 OK.	

4.2.3.1.2 Full IMS Registration and Subscription Call Flow

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

Step	Direction		Message	Comment	
	UE	IMS			
1				The UE establishes an IP bearer as required by its specific access network (optional).	
2	←→			P-CSCF address discovery using DHCP procedures for IPv4 (optional).	
3	→		REGISTER	The UE sends initial registration for IMS services.	Unprotected
4	←		401 Unauthorized	The IMS responds with a valid Digest AKA authentication challenge and a list of integrity and encryption algorithms supported by the network as defined in the IMS AKA procedure of TS 133 203 [7].	
5				Upon receipt of 401 Unauthorized, the UE selects the first integrity and encryption algorithm combination on the list received from the P-CSCF in 401 Unauthorized which is also supported by the UE. If the P-CSCF did not include any confidentiality algorithm in 401 Unauthorized then the UE shall select the NULL encryption algorithm. The UE then proceeds to establish two new pairs of IPSEC Security Associations (SA1 and SA2).	
6	→		REGISTER	The UE sends another REGISTER with authentication credentials over IPSEC security association SA1.	Protected by SA1
7	←		200 OK	The IMS responds with 200 OK over the same IPSEC security association SA1.	
8	→		SUBSCRIBE	The UE subscribes to its registration event package over the IPSEC security association SA2.	Protected by SA2
9	←		200 OK or 202 Accepted	The IMS responds with 200 OK or 202 Accepted over the IPSEC security association SA2.	
10	←		NOTIFY	The IMS sends initial NOTIFY for registration event package, containing full registration state information for the registered public user identity in the XML body, over the IPSEC security association SA2.	
11	→		200 OK	The UE responds with 200 OK over the IPSEC security association SA2.	

4.2.3.1.3 SIP Digest Registration and Subscription Call Flow

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

Step	Direction		Message	Comment	
	UE	IMS			
1				The UE establishes an IP bearer as required by its specific access network (optional).	
2	←→			P-CSCF address discovery using DHCP procedures for IPv4 (optional).	
3	→		REGISTER	The UE sends initial registration for IMS services.	Unprotected
4	←		401 Unauthorized	The IMS responds with a valid HTTP Digest authentication challenge as defined in RFC 2617 [8].	
5	→		REGISTER	The UE sends another REGISTER with authentication credentials.	
6	←		200 OK	The IMS responds with 200 OK.	
7	→		SUBSCRIBE	The UE subscribes to its registration event package.	
8	←		200 OK or 202 Accepted	The IMS responds with 200 OK or 202 Accepted.	
9	←		NOTIFY	The IMS sends initial NOTIFY for registration event package, containing full registration state information for the registered public user identity in the XML body.	
10	→		200 OK	The UE responds with 200 OK.	

4.2.4 Supported Options

4.2.4.1 Security

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

4.2.4.2 Signalling Compression

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

4.3 Test Infrastructure

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

4.3.1 Core IMS Nodes

The current testing scope includes IMS roaming and border control functionality. For IMS roaming, Mw reference point between IMS core in visited network (P-CSCF) and IMS core in home network will be monitored for testing purposes. For border control functionality, Mx reference point between IMS Core and IBCF, Ici reference point between an IBCF and another IBCF or I-CSCF belonging to a different IM CN subsystem network and Izi reference point between a TrGW and another TrGW or media handling node belonging to a different IM CN subsystem network will be monitored for testing purposes. For all test cases not requiring IMS roaming or 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 (excluding Mx reference point between IMS Core and IBCF when border control functionality is required) 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 the Mw reference point 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 border control functionalities are applied, the Mw reference point 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. When border control functionalities are applied, the Mx reference point between S-CSCF and IBCF within the same network domain, is used as a PO for NNI interoperability checks.

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 border control functionalities are applied, the Mw reference point 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. When border control functionalities are applied, the Mx reference point between I-CSCF and IBCF within the same network domain, is used as a PO for NNI interoperability checks.

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 border control functionalities such as topology hiding, transport plane control, screening of SIP signalling or application level gateway (for instance enabling communication between IPv6 and IPv4 SIP applications). However, the IBCF can act also as a pass-through entity between adjacent IMS networks. The IcI reference point 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.

4.3.1.4.2 Node Configuration

The IBCF should be configured to support the pre-requisites outlined in clause 4.2. The IBCF node will be present in all tests 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 does not apply this functionality. In case the requirement to support application level gateway (ALG) is not explicitly stated in the pre-conditions of a test description it shall be assumed that the IBCF does not apply this functionality.

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
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

The Media Resource Function Controller (MRFC) is a signalling plane node that acts as a SIP User Agent to the S-CSCF, and which controls the MRFP across an H.248 interface. The Mr interface between the MRFC and the S-CSCF, the Cr/Sr interfaces to the AS and the Mp interface to the MRFP are considered internal IMS 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.

4.3.1.7 MRFP

4.3.1.7.1 Relevant Interfaces

The Media Resource Function Processor (MRFP) is a media plane node that implements all media-related functions. The Mp interface between the MRFP and the MRFC is considered an internal IMS interface.

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.

4.3.1.8 MGCF

4.3.1.8.1 Relevant Interfaces

The Media Gateway Controller Function (MGCF) does call control protocol conversion between SIP and ISUP. It also controls the resources in a Media Gateway across an H.248 interface. The Mg reference point between the MGCF and an I-CSCF in the same network domain is used as a PO against which NNI interoperability tests are validated. The E1 reference point to the CS network is used to verify the codings of the ISUP messages.

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.

4.3.1.9 MGF

4.3.1.9.1 Relevant Interfaces

The Media Gateway Function (MGF) interfaces with the media plane of the CS network, by converting between RTP and PCM. It can also transcode when the codecs do not match. The reference points of the MGF with other entities are out of the scope of the test descriptions in the present document.

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.

4.3.1.10 SGF

4.3.1.10.1 Relevant Interfaces

The Signalling Gateway Function (SGF) interfaces with the signalling plane of the CS. It transforms lower layer protocols as Stream Control Transmission Protocol (SCTP) into Message Transfer Part (MTP) protocol), to pass ISDN User Part (ISUP) from the MGCF to the CS network.

4.3.1.10.2 Node Configuration

The SGF 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.

4.3.2 External IMS core 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 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 features.

4.3.2.2 AS

4.3.2.2.1 Relevant Interfaces

Interworking between external Application Servers (AS) and the IMS core is under the scope of the present document. The ISC interface between the S-CSCF and the AS is used as a Point of Observation (PO) 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]), OIP/OIR (see TS 124 407 [13]), IPTV(see TS 183 063 [14]) or Conference (see TS 124 247 [15]). In the case that an AS does not support one or more of these supplementary services, only a selected subset of the test descriptions in the present document should be used for IMS core network interoperability testing, i.e. test descriptions which do not contain any pass criteria related to these supplementary services.

4.3.3 Supporting IMS Nodes

4.3.3.1 DNS

4.3.3.1.1 Relevant Interfaces

The Domain Name Service (DNS) is considered as a supporting entity in this test specification. It is assumed that each IMS has its own local DNS which is connected to the common interconnect DNS.

4.3.3.1.2 Node Configuration

The common DNS should be configured for appropriate resource record handling as required to support proper resolution of all SIP URIs in Request URIs and Route headers. In addition, either the local or common DNS must support ENUM functionality in order to resolve Tel URIs into SIP URIs. As an example, a DNS should have an entry to map E.164 number 0633348273 to the SIP URI of userSIP.

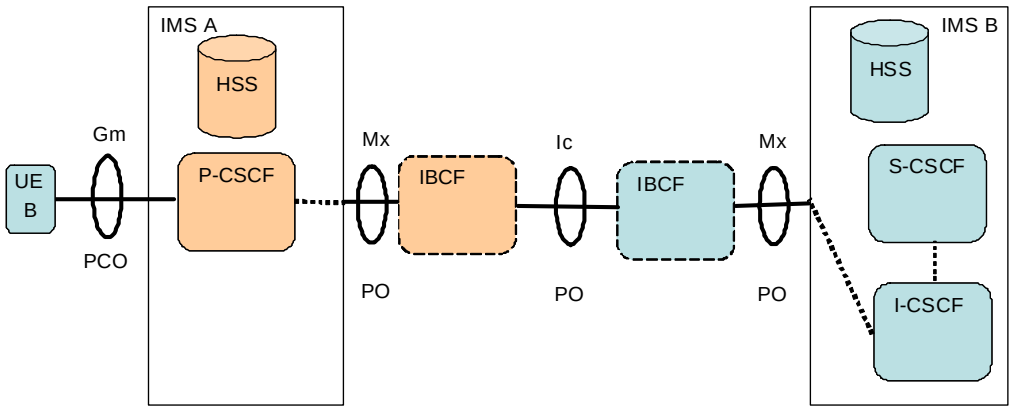
4.3.4 Test Configurations

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

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

Roaming Registration

CF_ROAM_REG

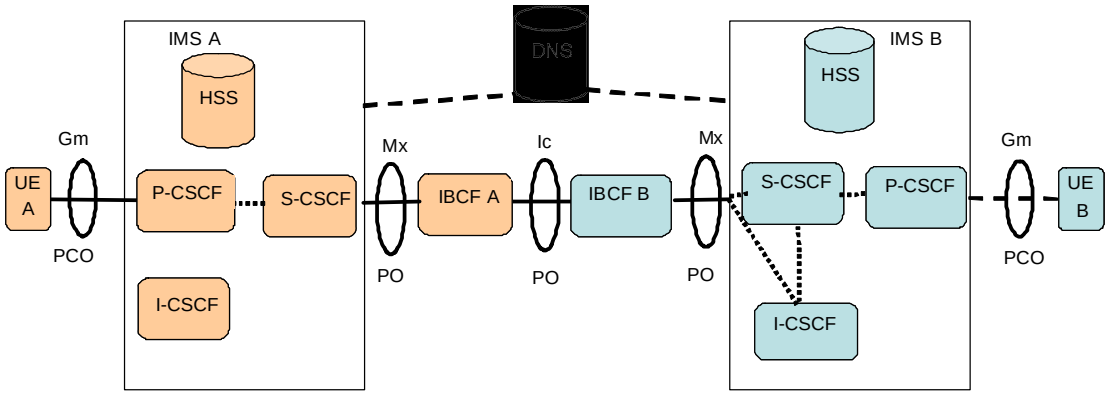


Precondition:
Different network operators performing origination and termination, UE_B roaming in visited network A (ROAM), UE_B not yet registered (REG), neither UE_A nor AS involved, IBCF is involved but no topology hiding performed
Test configuration for:
Registration requests and responses from UE_B
Example:
REGISTER prior to IMS VoIP voice call from UE_B

Figure 1: CF_ROAM_REG

Interworking Call

CF_INT_CALL

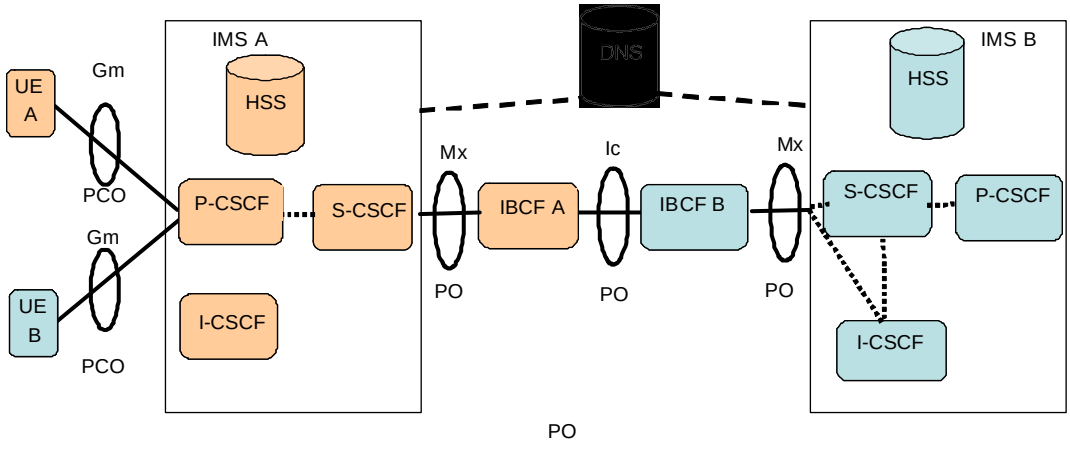


Precondition:
Different network operators performing origination and termination, both UEs or only UE A in home networks (INT), both UE's registered, no AS, a common interconnect DNS and local DNSs for each IMS may be involved, IBCF is involved, topology hiding may apply
Test configuration for:
Requests 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

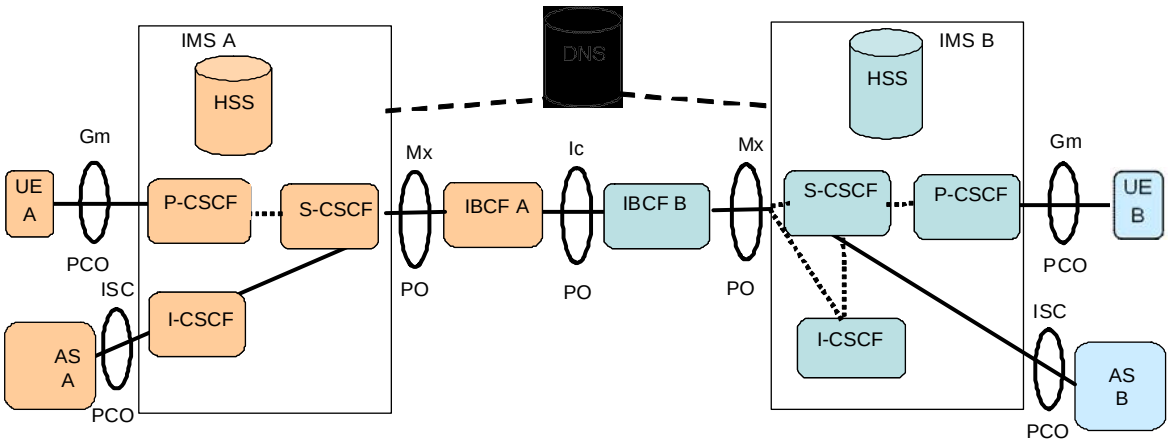


Precondition:
Different network operators performing origination and termination, UE_B roaming (ROAM) via IMS_A, UE_A in home network, both UEs are registered, no AS, IBCF is involved, topology hiding may apply
Test configuration for:
Requests and responses between UEB and UE_A in call (CALL) and messaging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

Figure 3: CF_ROAM_CALL

Interworking Application Server

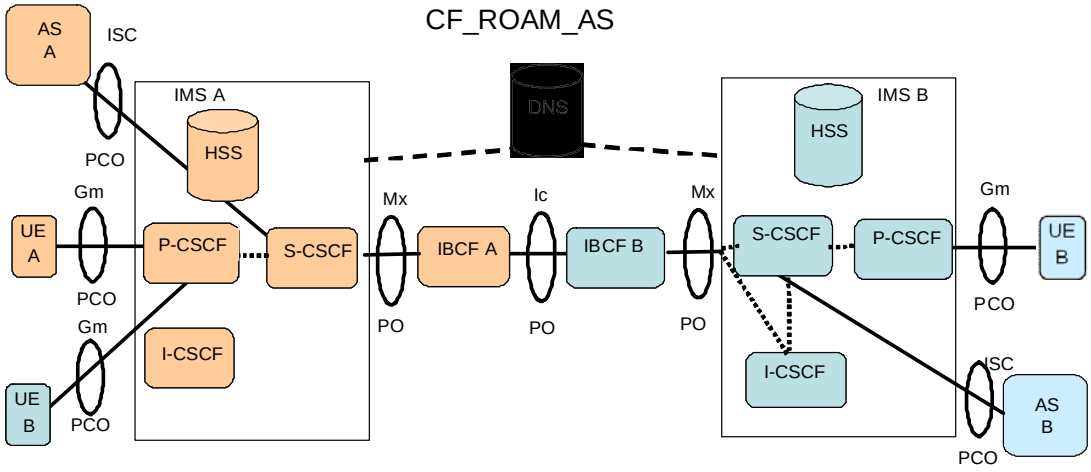
CF_INT_AS



Precondition:
Different network operators performing origination and termination, UE_A and UE_B in home networks (INT), both UEs registered, AS for UE_A and UE_B (AS), IBCF is involved, topology hiding may apply
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

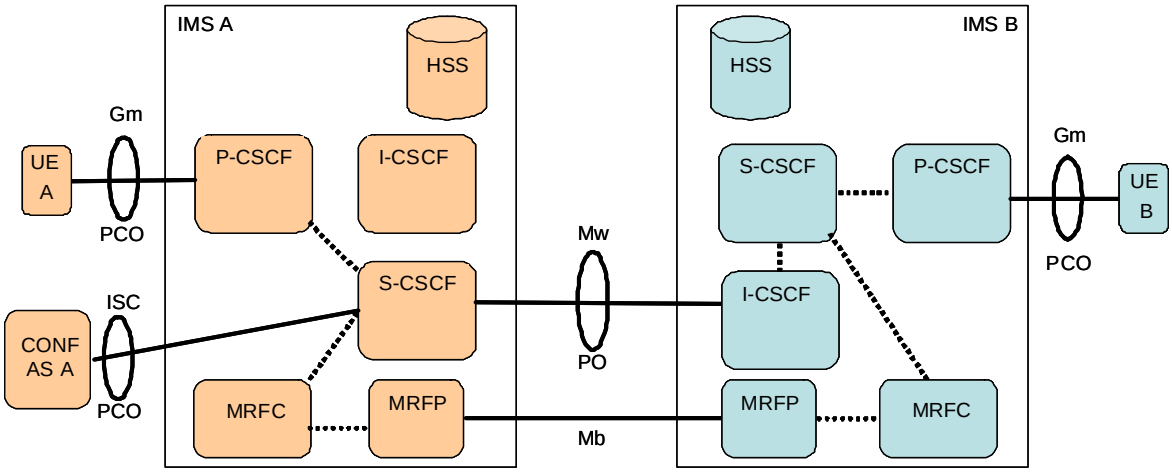
CF_ROAM_AS



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 is involved, topology hiding may apply
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)

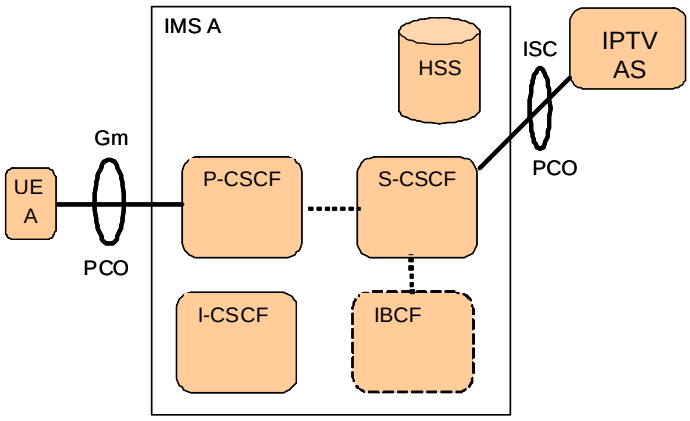
Example:

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:

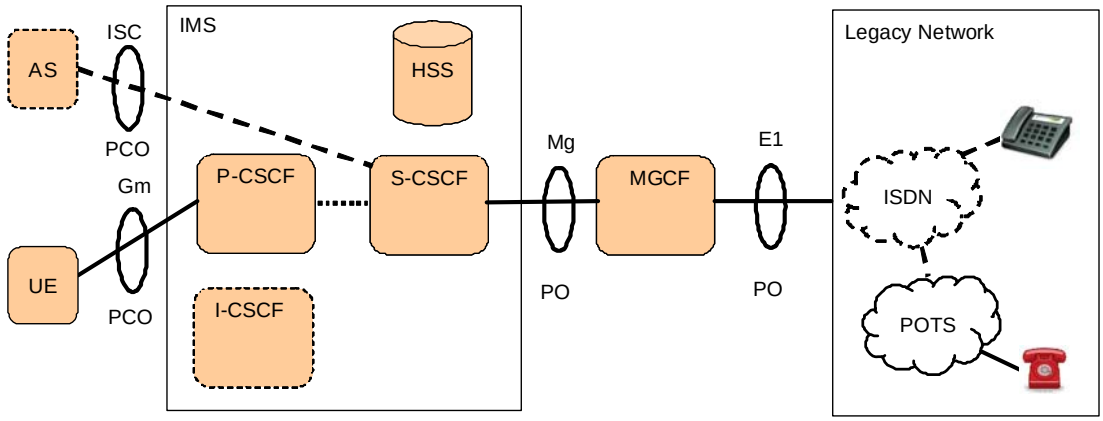
Requests and responses between UE_A and AS_A

Example:

Initial INVITE from UE_A to AS_A to initiate a IPTV Broadcast session.

Figure 7: CF_IPTV

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 IUE 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	IBCF A	IBCF B	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 IBCF_A
4				⟶			REGISTER	IBCF_A forwards the REGISTER to IBCF_B
5					⟶		REGISTER	IBCF_B forwards the REGISTER to IMS_B
6					⟵		401 Unauthorized	IMS_B responds with 401 Unauthorized to IBCF_B
7				⟵			401 Unauthorized	IBCF_B forwards the 401 Unauthorized to IBCF_A
8			⟵				401 Unauthorized	IBCF_A forwards the 401 Unauthorized to IMS_A
9		⟵					401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
10		⟶					REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
11			⟶				REGISTER	IMS_A forwards the REGISTER to IBCF A
12				⟶			REGISTER	IBCF_A forwards the REGISTER to IBCF B
13					⟶		REGISTER	IBCF_B forwards the REGISTER to IMS B
14					⟵		200 OK	IMS_B responds with 200 OK
15				⟵			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
16			⟵				**200 OK**	**IBCF_A forwards the 200 OK response to IMS_A**
17		⟵					200 OK	IMS_A forwards the 200 OK response to UE_B
18			⟶				SUBSCRIBE	IMS_A sends a SUBSCRIBE to IBCF_A
19				⟶			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE to IBCF_B
20					⟶		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE to IMS_B
21					⟵		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
22				⟵			200 OK or 202 Accepted	IBCF_B forwards 200 OK or 202 Accepted to IBCF_A
23			⟵				200 OK or 202 Accepted	IBCF_A forwards 200 OK or 202 Accepted to IMS_A
24					⟵		NOTIFY	IMS_B sends a NOTIFY to IBCF_B, containing UE_B's registration status
25				⟵			NOTIFY	IBCF_B forwards NOTIFY to IBCF_A
26			⟵				NOTIFY	IBCF_A forwards NOTIFY to IMS_A
27			⟶				200 OK	IMS_A responds to the NOTIFY with a 200 OK
28				⟶			200 OK	IBCF_A forwards 200 OK response to IBCF_B
39					⟶		200 OK	IBCF_B forwards 200 OK response to IMS_B
30		⟶					SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
31			⟶				SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IBCF_A
32				⟶			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE request to IBCF_B
33					⟶		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE request to IMS_B
34					⟵		200 OK or 202 Accepted	IMS_B responds with 200 OK or 202 Accepted
35				⟵			200 OK or 202 Accepted	IBCF_B forwards the 200 OK or 202 Accepted response to IBCF_A
36			⟵				200 OK or 202 Accepted	IBCF_A forwards the 200 OK or 202 Accepted response to IMS_A

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
37		←					200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
38					←		NOTIFY	IMS_B sends a NOTIFY to IBCF_B, containing UE_B's registration status
39				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
40			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
41		←					NOTIFY	IMS_A forwards the NOTIFY to UE_B
42		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
43			→				200 OK	IMS_A forwards the 200 OK to IBCF_A
44				→			200 OK	IBCF_A forwards the 200 OK to IBCF_B
45					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
46	←							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 12
3	User A is informed that UE_B is ringing	Step 18
4	User B answers call	Step 19
5	User A is informed that call has been answered	Step 25
6	User B is informed that the call is established	Step 31
7A	User A ends call	Step 32A
7B	User B ends call	Step 32B
8A	User B is informed that call has ended	Step 38A
8B	User A is informed that call has ended	Step 38B
9A	User A is informed that call has ended	Step 44A
9B	User B is informed that call has ended	Step 44B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1	→									User A calls User B
2		→	→						INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→	→					INVITE	IMS_A forwards INVITE to IBCF_A
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→	→			INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10						→	→		INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B
15				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16			←						180 Ringing	IBCF_A forwards 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 IBCF_B
22				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
23			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
24		←							200 OK	IMS_A forwards 200 OK response to UE_A
25	←									User A is informed that call has been answered
26		→	→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27			→	→					ACK	IMS_A forwards ACK to IBCF_A
28				→	→				ACK	IBCF_A forwards ACK to IBCF_B
29					→	→			ACK	IBCF_B forwards ACK to IMS_B
30						→	→		ACK	IMS_B forwards ACK to UE_B
31							→	→		User B is informed that the call is established
32A	→									User A ends call
33A		→	→						BYE	UE_A releases the call with BYE
34A			→	→					BYE	IMS_A forwards BYE to IBCF_A
35A				→	→				BYE	IBCF_A forwards BYE to IBCF_B
36A					→	→			BYE	IBCF_B forwards BYE to IMS_B
37A						→	→		BYE	IMS_B forwards BYE to UE_B
38A							→	→		User B is informed that call has ended
39A						←			200 OK	UE_B sends 200 OK for BYE
40A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
41A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
42A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
43A		←							200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
44A	←									User A is informed that call has ended
32B							←			User B ends call
33B						←			BYE	UE_B releases the call with BYE
34B					←				BYE	IMS_B forwards BYE to IBCF_B
35B				←					BYE	IBCF_B forwards BYE to IBCF_A
36B			←						BYE	IBCF_A forwards BYE to IMS_A
37B		←							BYE	IMS_A forwards BYE to UE_A
38B	←									User A is informed that call has ended
39B		→							200 OK	UE_A sends 200 OK for BYE
40B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
41B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
42B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
43B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
44B							→			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	IMS A	IBCF A	IBCF B	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 IBCF_A
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				INVITE	IMS_B forwards INVITE to IBCF_B
11					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
12				←					INVITE	IBCF_B forwards INVITE to IBCF_A
13				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
14			←						INVITE	IBCF_A forwards INVITE to IMS_A
15			→						100 Trying	IMS_A responds with a 100 Trying provisional response
16			—	—	—	→			INVITE	IMS_A forwards INVITE to UE_B
17			←	—	—	—			100 Trying	UE_B optionally responds with a 100 Trying provisional response
18							→			User B is informed of incoming call of User A
19			←	—	—	—			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
20			→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
21				→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22					→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23					←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
24				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25			←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
26		←							180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
27	←									User A is informed that UE_A is ringing
28							←			User B answers call
29			←						200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
30			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
31				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
32					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
33					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
34				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
35			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
36		←							200 OK	IMS_A forwards 200 OK response to UE_A
37	←									User A is presented that call in process
38		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
39			→						ACK	IMS_A forwards ACK to IBCF_A
40				→					ACK	IBCF_A forwards ACK to IBCF_B
41					→				ACK	IBCF_B forwards ACK to IMS_B
42					←				ACK	IMS_B forwards ACK to IBCF_B
43				←					ACK	IBCF_B forwards ACK to IBCF_A
44			←						ACK	IBCF_A forwards ACK to IMS_A
45			→	→	→	→	→		ACK	IMS_A forwards ACK to UE_B
46							→	→		User B is informed that the call is in progress
47A	→									User A ends call
48A		→							BYE	UE_A releases the call with BYE
49A			→						BYE	IMS_A forwards BYE to IBCF_A
50A				→					BYE	IBCF_A forwards BYE to IBCF_B
51A					→				BYE	IBCF_B forwards BYE to IMS_B
52A					←				BYE	IMS_B forwards BYE to IBCF_B
53A				←					BYE	IBCF_B forwards BYE to IBCF_A
54A			←						BYE	IBCF_A forwards BYE to IMS_A
55A			→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
56A							→	→		User B is informed that call has ended
57A			←	←	←	←	←		200 OK	UE_B sends 200 OK for BYE
58A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
59A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
62A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
63A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
64A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
65A	←									User A is informed that call has ended
47B	→									User A ends call

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
48B			→						BYE	UE_A releases the call with BYE
49B			→	→					BYE	IMS_A forwards BYE to IBCF_A
50B				→	→				BYE	IBCF_A forwards BYE to IBCF_B
51B					→	→			BYE	IBCF_B forwards BYE to IMS_B
52B					←	→			BYE	IMS_B forwards BYE to IBCF_B
53B				←	←				BYE	IBCF_B forwards BYE to IBCF_A
54B			←	←					BYE	IBCF_A forwards BYE to IMS_A
55B			→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
56B							→	→		User B is informed that call has ended
57B			←	→	→	→	→		200 OK	UE_B sends 200 OK for BYE
58B			→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
59B				→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
60B					→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
61B					←	→			200 OK	IMS_B forwards 200 OK response to IBCF_B
62B				←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
63B			←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
64B			←						200 OK	IMS_A forwards the 200 OK response to UE_A
65B		←								User A 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 18
3	User B is informed that UE_A is ringing	Step 27
4	User A answers call	Step 28
5	User B is informed that call has been answered	Step 37
6	User A is informed that the call is established	Step 46
7A	User A ends call	Step 47A
7B	User B ends call	Step 47B
8A	User B is informed that call has ended	Step 56A
8B	User A is informed that call has ended	Step 56B
9A	User A is informed that call has ended	Step 65A
9B	User B is informed that call has ended	Step 65B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1							←			User B calls User A
2			←	←	←	←	←		INVITE	UE_B sends INVITE with the first SDP offer indicating all desired medias 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 IBCF_A
5			←	←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
7				←	←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→	→			INVITE	IBCF_B forwards INVITE to IMS_B
9					←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
10					←	←			INVITE	IMS_B forwards INVITE to IBCF_B
11					→	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
12				←	←				INVITE	IBCF_B forwards INVITE to IBCF_A
13				→	→				100 Trying	IBCF_A responds with a 100 Trying provisional response
14			←	←					INVITE	IBCF_A forwards INVITE to IMS_A
15			→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
16		←	←						INVITE	IMS_A forwards 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
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 180 Ringing response to IBCF_A
21				→	→				180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22					→	→			180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23					←	←			180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
24				←	←				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25			←	←					180 Ringing	IBCF_A forwards 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 200 OK response to IBCF_A
31				→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
32					→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
33					←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
34				←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
35			←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
36			→	→	→	→	→		200 OK	IMS_A forwards 200 OK response to UE_B
37							→			User B is presented that call in process
38			←	←	←	←	←		ACK	UE_B acknowledges the receipt of 200 OK for INVITE

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
39			→						ACK	IMS_A forwards ACK to IBCF_A
40				→					ACK	IBCF_A forwards ACK to IBCF_B
41					→				ACK	IBCF_B forwards ACK to IMS_B
42					←				ACK	IMS_B forwards ACK to IBCF_B
43				←					ACK	IBCF_B forwards ACK to IBCF_A
44			←						ACK	IBCF_A forwards ACK to IMS_A
45		←							ACK	IMS_A forwards ACK to UE_A
46	←									User A is informed that the call is in progress
47A	→									User A ends call
48A		→							BYE	UE_A releases the call with BYE
49A			→						BYE	IMS_A forwards BYE to IBCF_A
50A				→					BYE	IBCF_A forwards BYE to IBCF_B
51A					→				BYE	IBCF_B forwards BYE to IMS_B
52A					←				BYE	IMS_B forwards BYE to IBCF_B
53A				←					BYE	IBCF_B forwards BYE to IBCF_A
54A			←						BYE	IBCF_A forwards BYE to IMS_A
55A			→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
56A							→	→		User B is informed that call has ended
57A			←	←	←	←	←		200 OK	UE_B sends 200 OK for BYE
58A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
59A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
62A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
63A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
64A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
65A	←									User A is informed that call has ended
47B	→									User A ends call
48B		→							BYE	UE_A releases the call with BYE
49B			→						BYE	IMS_A forwards BYE to IBCF_A
50B				→					BYE	IBCF_A forwards BYE to IBCF_B
51B					→				BYE	IBCF_B forwards BYE to IMS_B
52B					←				BYE	IMS_B forwards BYE to IBCF_B
53B				←					BYE	IBCF_B forwards BYE to IBCF_A
54B			←						BYE	IBCF_A forwards BYE to IMS_A
55B			→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
56B							→	→		User B is informed that call has ended
57B			←	←	←	←	←		200 OK	UE_B sends 200 OK for BYE
58B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
59B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61B					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
62B				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
63B			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
64B		←							200 OK	IMS_A forwards the 200 OK response to UE_A
65B	←									User A 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):

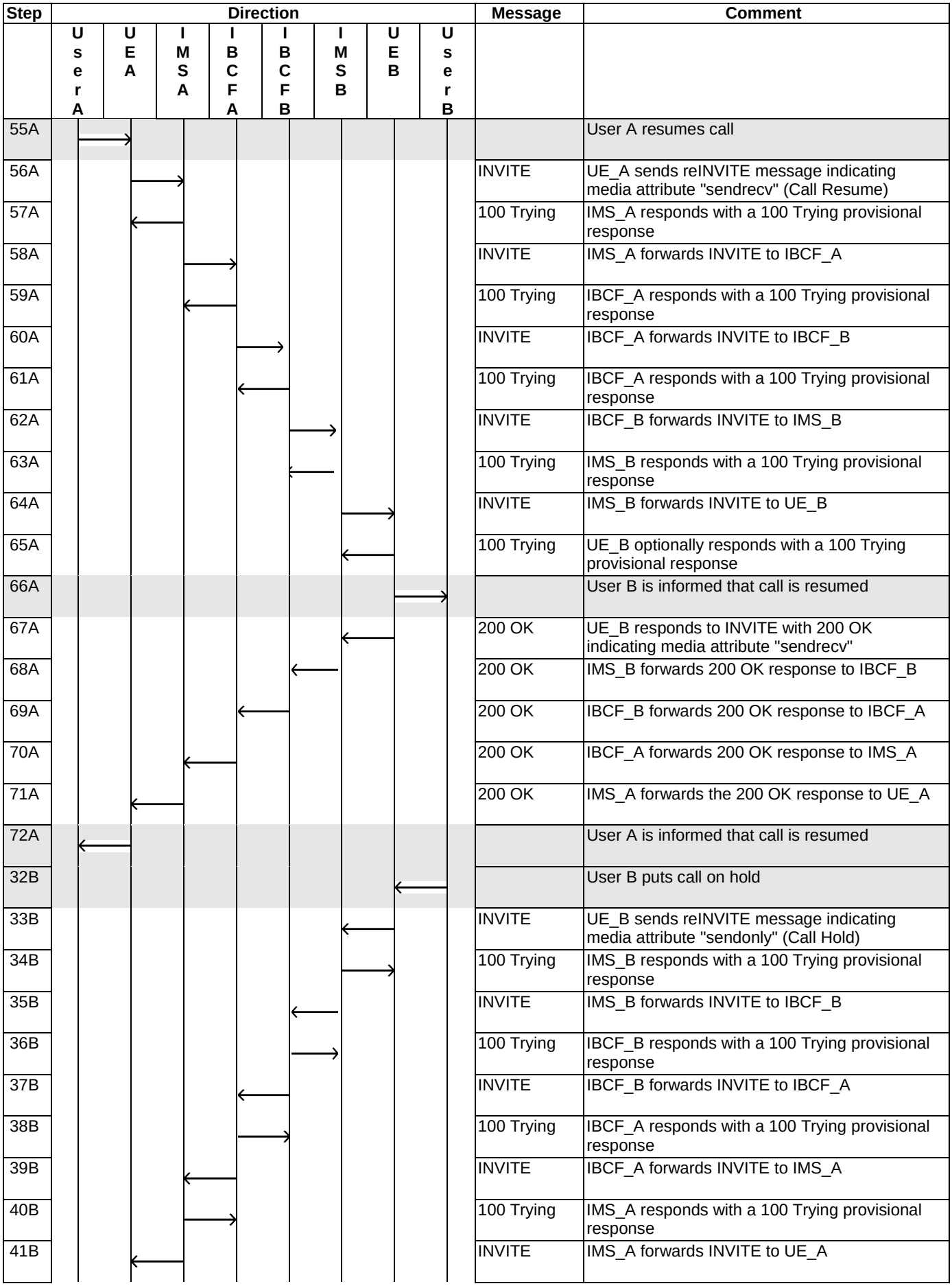
Step	Action	CF_INT_CALL	CF_ROAM_CALL
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	12	18
3	User A is informed that UE_B is ringing	18	27
4	User B answers call	19	28
5	User A is informed that call has been answered	25	37
6	User B is presented that call is established	31	46
7A	User A puts call on hold	32A	47A
7B	User B puts call on hold	32B	47B
8A	User B is informed that call on hold	49A	64A
8B	User A is informed that call on hold	49B	64B
9A	User A resumes call	55A	82A
9B	User B resumes call	55B	82B
10A	User B is informed that call is resumed	66A	99A
10B	User A is informed that call is resumed	66B	99B
11A	User A is informed that call is resumed	72A	108A
11B	User B is informed that call is resumed	72B	108B
12	User A ends call	73	109
13	User B is informed that call has ended	79	118
14	User A is informed that call has ended	85	127

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	IBCF A	IBCF B	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
3			←						100 Trying	IMS_A responds with a 100 Trying provisional response
4				→					INVITE	IMS_A forwards INVITE to IBCF_A
5				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6					→				INVITE	IBCF_A forwards INVITE to IBCF_B
7					←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8						→			INVITE	IBCF_B forwards INVITE to IMS_B
9						←			100 Trying	IMS_B responds with a 100 Trying provisional response
10							→		INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B
15					←				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16				←					180 Ringing	IBCF_A forwards 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 IBCF_B
22					←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
23				←					200 OK	IBCF_A forwards 200 OK response to IMS_A
24			←						200 OK	IMS_A forwards 200 OK response to UE_A
25	←									User A is informed that call has been answered
26		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
27			→	→					ACK	IMS_A forwards ACK to IBCF_A
28				→	→				ACK	IBCF_A forwards ACK to IBCF_B
29					→	→			ACK	IBCF_B forwards ACK to IMS_B
30						→	→		ACK	IMS_B forwards ACK to UE_B
31								→		User B is presented that call is in progress
32A	→	→								User A puts call on hold
33A		→	→						INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
34A		←	←						100 Trying	IMS_A responds with a 100 Trying provisional response
35A			→	→					INVITE	IMS_A forwards INVITE to IBCF_A
36A			←	←					100 Trying	IBCF_A responds with a 100 Trying provisional response
37A				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
38A				←	←				100 Trying	IBCF_A responds with a 100 Trying provisional response
39A					→	→			INVITE	IBCF_B 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 on hold
44A						←	←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
45A					←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
46A				←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
47A			←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
48A		←	←						200 OK	IMS_A forwards the 200 OK response to UE_A
49A	←	←								User A is informed that call is on hold
50A		→	→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
51A			→	→					ACK	IMS_A forwards ACK to IBCF_A
52A				→	→				ACK	IBCF_A forwards ACK to IBCF_B
53A					→	→			ACK	IBCF_B forwards ACK to IMS_B
54A						→	→		ACK	IMS_B forwards ACK to UE_B



Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
55A										User A resumes call
56A									INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
57A									100 Trying	IMS_A responds with a 100 Trying provisional response
58A									INVITE	IMS_A forwards INVITE to IBCF_A
59A									100 Trying	IBCF_A responds with a 100 Trying provisional response
60A									INVITE	IBCF_A forwards INVITE to IBCF_B
61A									100 Trying	IBCF_A responds with a 100 Trying provisional response
62A									INVITE	IBCF_B forwards INVITE to IMS_B
63A									100 Trying	IMS_B responds with a 100 Trying provisional response
64A									INVITE	IMS_B forwards INVITE to UE_B
65A									100 Trying	UE_B optionally responds with a 100 Trying provisional response
66A										User B is informed that call is resumed
67A									200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
68A									200 OK	IMS_B forwards 200 OK response to IBCF_B
69A									200 OK	IBCF_B forwards 200 OK response to IBCF_A
70A									200 OK	IBCF_A forwards 200 OK response to IMS_A
71A									200 OK	IMS_A forwards the 200 OK response to UE_A
72A										User A is informed that call is resumed
32B										User B puts call on hold
33B									INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
34B									100 Trying	IMS_B responds with a 100 Trying provisional response
35B									INVITE	IMS_B forwards INVITE to IBCF_B
36B									100 Trying	IBCF_B responds with a 100 Trying provisional response
37B									INVITE	IBCF_B forwards INVITE to IBCF_A
38B									100 Trying	IBCF_A responds with a 100 Trying provisional response
39B									INVITE	IBCF_A 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

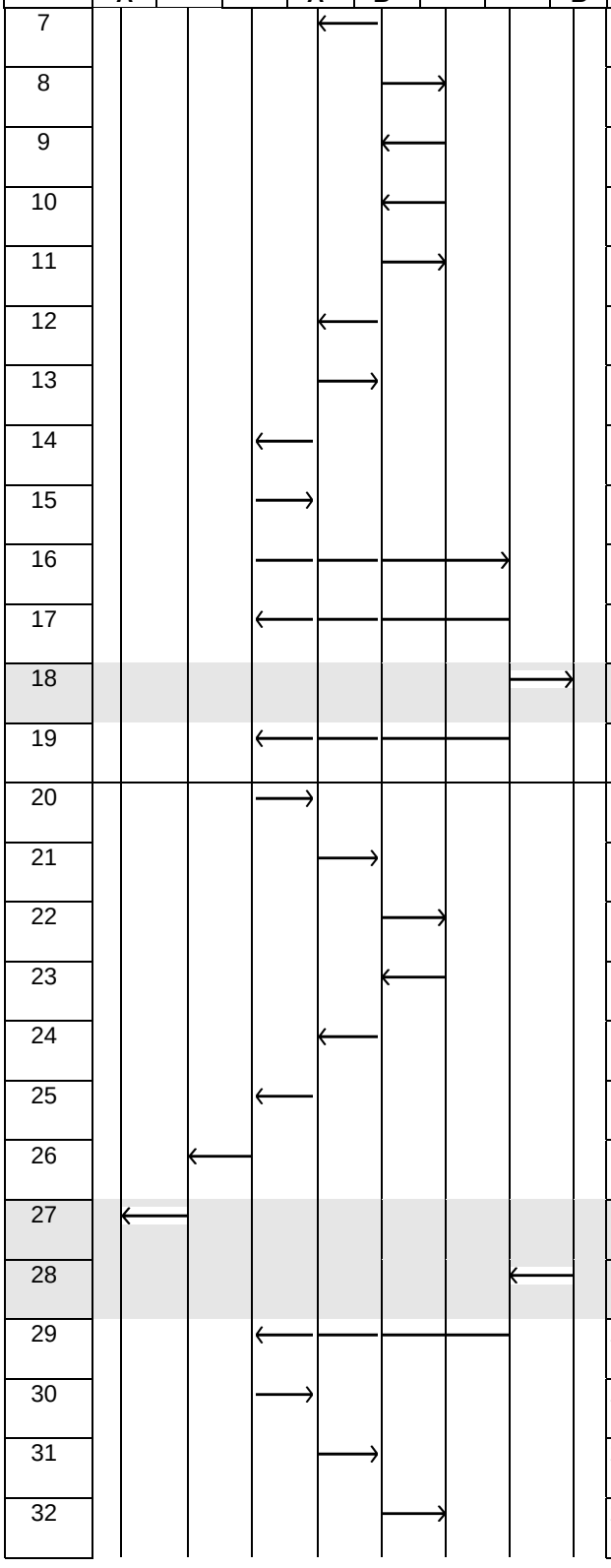
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
42B		→	→						100 Trying	UE_A optionally responds with a 100 Trying provisional response
43B	←	←								User A is informed that call is on hold
44B		→	→						200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "recvonly"
45B			→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
46B				→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
47B					→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
48B						→	→		200 OK	IMS_B forwards the 200 OK response to UE_B
49B							→	→		User B is informed that call is on hold
50B						←	←		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
51B					←	←			ACK	IMS_B forwards ACK to IBCF_B
52B				←	←				ACK	IBCF_B forwards ACK to IBCF_B
53B			←	←					ACK	IBCF_B forwards ACK to IMS_A
54B		←	←						ACK	IMS_A forwards ACK to UE_A
55B							←	←		User B resumes call
56B						←	←		INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
57B						→	→		100 Trying	IMS_B responds with a 100 Trying provisional response
58B					←	←			INVITE	IMS_B forwards INVITE to IBCF_B
59B					→	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
60B				←	←				INVITE	IBCF_B forwards INVITE to IBCF_A
61B				→	→				100 Trying	IBCF_B responds with a 100 Trying provisional response
62B			←	←					INVITE	IBCF_A forwards INVITE to IMS_A
63B			→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
64B		←	←						INVITE	IMS_A forwards INVITE to UE_A
65B		→	→						100 Trying	UE_A optionally responds with a 100 Trying provisional response
66B	←	←								User A is informed that call is resumed
67B		→	→						200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "sendrecv"
68B			→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
69B				→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
70B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
71B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
72B							→			User B is informed that call is resumed
73	→									User A ends call
74		→							BYE	UE_A releases the call with BYE
75			→						BYE	IMS_A forwards BYE to IBCF_A
76				→					BYE	IBCF_A forwards BYE to IBCF_B
77					→				BYE	IBCF_B forwards BYE to IMS_B
78						→			BYE	IMS_B forwards BYE to UE_B
79							→			User B is informed that call has ended
80						←			200 OK	UE_B sends 200 OK for BYE
81					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
82				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
83			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
84		←							200 OK	IMS_A forwards the 200 OK response to UE_A
85	←									User A is informed that call has ended

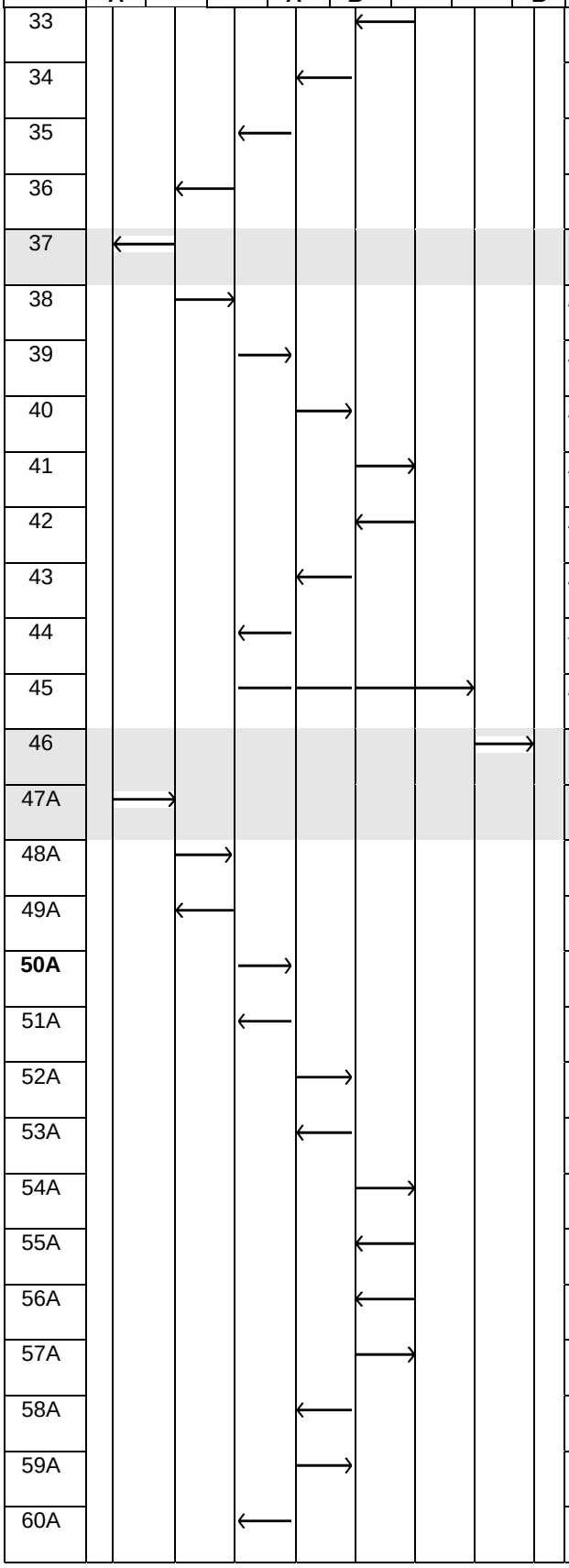
4.4.3.1.3 UC_03_R: SIP Call Flow "call hold and resume" using reINVITE with CF_ROAM_CALL

The expected call flow sequence is:

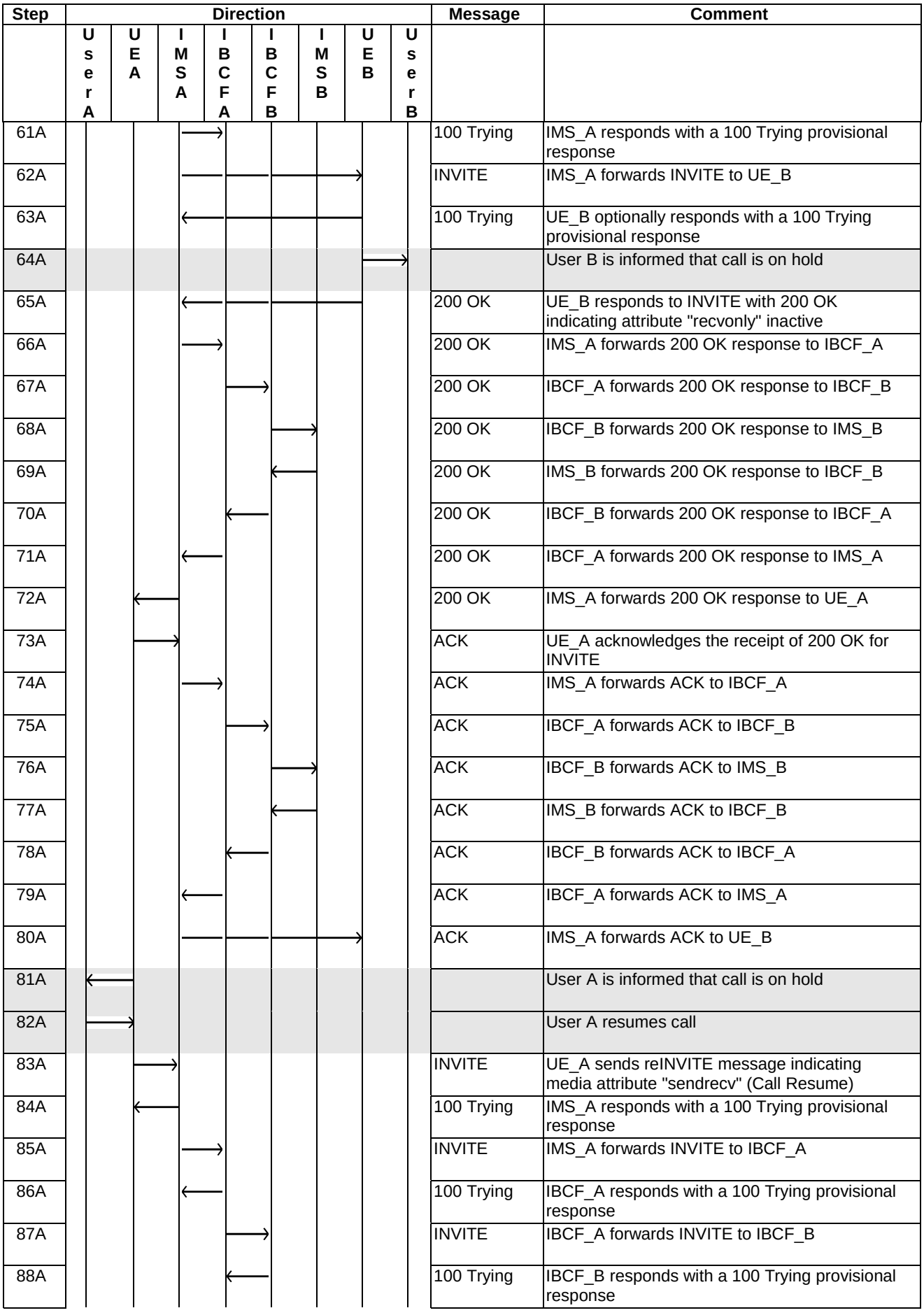
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						INVITE	IMS_A forwards INVITE to IBCF_A
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B



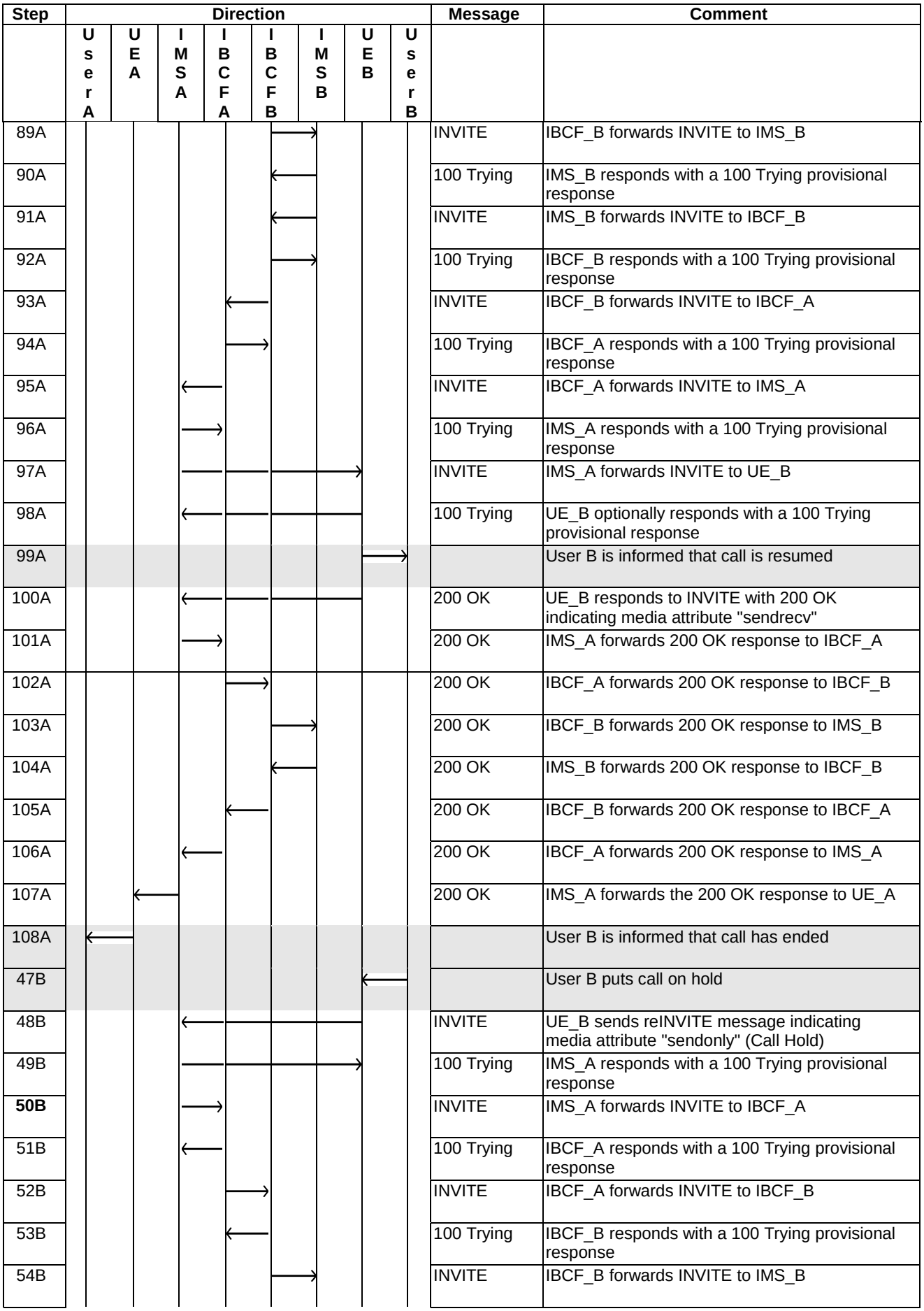
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				INVITE	IMS_B forwards INVITE to IBCF_B
11					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
12				←					INVITE	IBCF_B forwards INVITE to IBCF_A
13				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
14			←						INVITE	IBCF_A forwards INVITE to IMS_A
15			→						100 Trying	IMS_A responds with a 100 Trying provisional response
16			—	—	—	→			INVITE	IMS_A forwards INVITE to UE_B
17			←	—	—	—			100 Trying	UE_B optionally responds with a 100 Trying provisional response
18							→			User B is informed of incoming call of User A
19			←	—	—	—			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20			→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
21				→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22					→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23					←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
24				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25			←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
26		←							180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
27	←									User A is informed that UE_B is ringing
28							←			User B answers call
29			←	—	—	—			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
30			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
31				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
32					→				200 OK	IBCF_B forwards 200 OK response to IMS_B



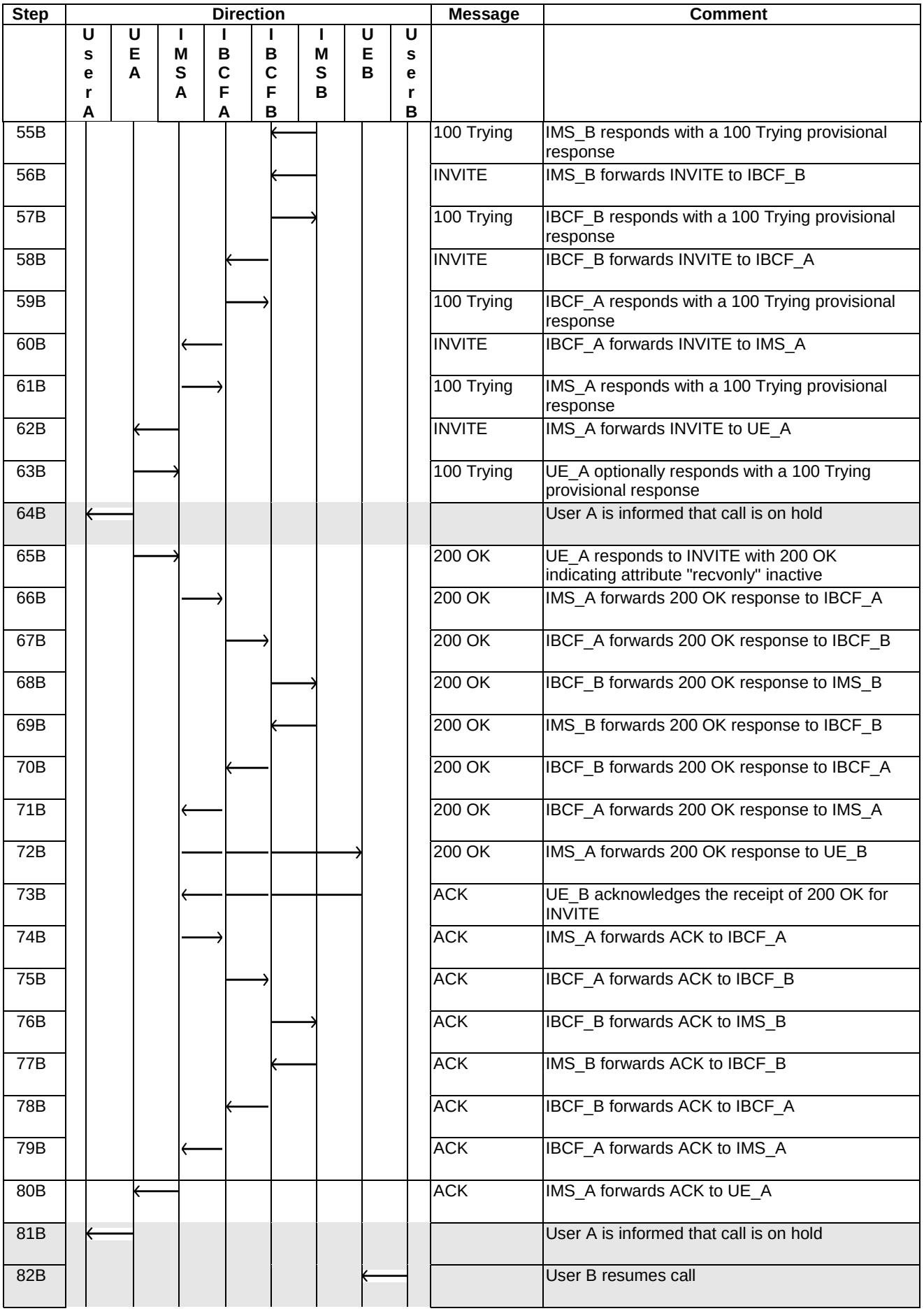
Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
33									200 OK	IMS_B forwards 200 OK response to IBCF_B
34									200 OK	IBCF_B forwards 200 OK response to IBCF_A
35									200 OK	IBCF_A forwards 200 OK response to IMS_A
36									200 OK	IMS_A forwards 200 OK response to UE_A
37										User A is informed that call has been answered
38									ACK	UE_A acknowledges the receipt of 200 OK for INVITE
39									ACK	IMS_A forwards ACK to IBCF_A
40									ACK	IBCF_A forwards ACK to IBCF_B
41									ACK	IBCF_B forwards ACK to IMS_B
42									ACK	IMS_B forwards ACK to IBCF_B
43									ACK	IBCF_B forwards ACK to IBCF_A
44									ACK	IBCF_A forwards ACK to IMS_A
45									ACK	IMS_B forwards ACK to UE_B
46										User B is presented that call is in progress
47A										User A puts call on hold
48A									INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
49A									100 Trying	IMS_A responds with a 100 Trying provisional response
50A									INVITE	IMS_A forwards INVITE to IBCF_A
51A									100 Trying	IBCF_A responds with a 100 Trying provisional response
52A									INVITE	IBCF_A forwards INVITE to IBCF_B
53A									100 Trying	IBCF_B responds with a 100 Trying provisional response
54A									INVITE	IBCF_B forwards INVITE to IMS_B
55A									100 Trying	IMS_B responds with a 100 Trying provisional response
56A									INVITE	IMS_B forwards INVITE to IBCF_B
57A									100 Trying	IBCF_B responds with a 100 Trying provisional response
58A									INVITE	IBCF_B forwards INVITE to IBCF_A
59A									100 Trying	IBCF_A responds with a 100 Trying provisional response
60A									INVITE	IBCF_A forwards INVITE to IMS_A



Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
61A			→						100 Trying	IMS_A responds with a 100 Trying provisional response
62A			→	→	→	→			INVITE	IMS_A forwards INVITE to UE_B
63A			←						100 Trying	UE_B optionally responds with a 100 Trying provisional response
64A							→			User B is informed that call is on hold
65A			←						200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
66A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
67A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
68A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
69A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
70A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
71A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
72A		←							200 OK	IMS_A forwards 200 OK response to UE_A
73A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
74A			→						ACK	IMS_A forwards ACK to IBCF_A
75A				→					ACK	IBCF_A forwards ACK to IBCF_B
76A					→				ACK	IBCF_B forwards ACK to IMS_B
77A					←				ACK	IMS_B forwards ACK to IBCF_B
78A				←					ACK	IBCF_B forwards ACK to IBCF_A
79A			←						ACK	IBCF_A forwards ACK to IMS_A
80A			→	→	→	→			ACK	IMS_A forwards ACK to UE_B
81A	←									User A is informed that call is on hold
82A	→									User A resumes call
83A		→							INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
84A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
85A			→						INVITE	IMS_A forwards INVITE to IBCF_A
86A			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
87A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
88A				←					100 Trying	IBCF_B responds with a 100 Trying provisional response



Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
89A					→	→			INVITE	IBCF_B forwards INVITE to IMS_B
90A					←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
91A					←	←			INVITE	IMS_B forwards INVITE to IBCF_B
92A					→	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
93A				←	←				INVITE	IBCF_B forwards INVITE to IBCF_A
94A				→	→				100 Trying	IBCF_A responds with a 100 Trying provisional response
95A			←	←					INVITE	IBCF_A forwards INVITE to IMS_A
96A			→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
97A			→	→	→	→	→		INVITE	IMS_A forwards INVITE to UE_B
98A			←	←	←	←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
99A							→			User B is informed that call is resumed
100A			←	←	←	←	←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
101A			→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
102A				→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
103A					→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
104A					←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
105A				←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
106A			←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
107A		←	←						200 OK	IMS_A forwards the 200 OK response to UE_A
108A	←	←								User B is informed that call has ended
47B							←			User B puts call on hold
48B			←	←	←	←	←		INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
49B			→	→	→	→	→		100 Trying	IMS_A responds with a 100 Trying provisional response
50B			→	→					INVITE	IMS_A forwards INVITE to IBCF_A
51B			←	←					100 Trying	IBCF_A responds with a 100 Trying provisional response
52B				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
53B				←	←				100 Trying	IBCF_B responds with a 100 Trying provisional response
54B					→	→			INVITE	IBCF_B forwards INVITE to IMS_B



Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
55B					←				100 Trying	IMS_B responds with a 100 Trying provisional response
56B					←				INVITE	IMS_B forwards INVITE to IBCF_B
57B					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
58B				←					INVITE	IBCF_B forwards INVITE to IBCF_A
59B				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
60B			←						INVITE	IBCF_A forwards INVITE to IMS_A
61B			→						100 Trying	IMS_A responds with a 100 Trying provisional response
62B		←							INVITE	IMS_A forwards INVITE to UE_A
63B		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
64B	←									User A is informed that call is on hold
65B		→							200 OK	UE_A responds to INVITE with 200 OK indicating attribute "recvonly" inactive
66B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
67B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
68B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
69B					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
70B				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
71B			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
72B			→	→	→	→			200 OK	IMS_A forwards 200 OK response to UE_B
73B			←	—	—	—			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
74B			→						ACK	IMS_A forwards ACK to IBCF_A
75B				→					ACK	IBCF_A forwards ACK to IBCF_B
76B					→				ACK	IBCF_B forwards ACK to IMS_B
77B					←				ACK	IMS_B forwards ACK to IBCF_B
78B				←					ACK	IBCF_B forwards ACK to IBCF_A
79B			←						ACK	IBCF_A forwards ACK to IMS_A
80B		←							ACK	IMS_A forwards ACK to UE_A
81B	←									User A is informed that call is on hold
82B							←			User B resumes call

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
83B			←	—	—	—	—		INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
84B			—	—	—	—	→		100 Trying	IMS_A responds with a 100 Trying provisional response
85B			—	→					INVITE	IMS_A forwards INVITE to IBCF_A
86B			←	—					100 Trying	IBCF_A responds with a 100 Trying provisional response
87B				—	→				INVITE	IBCF_A forwards INVITE to IBCF_B
88B				←	—				100 Trying	IBCF_B responds with a 100 Trying provisional response
89B					—	→			INVITE	IBCF_B forwards INVITE to IMS_B
90B					←	—			100 Trying	IMS_B responds with a 100 Trying provisional response
91B					←	—			INVITE	IMS_B forwards INVITE to IBCF_B
92B					—	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
93B					←	—			INVITE	IBCF_B forwards INVITE to IBCF_A
94B					—	—			100 Trying	IBCF_A responds with a 100 Trying provisional response
95B			←	—	—	—			INVITE	IBCF_A forwards INVITE to IMS_A
96B			—	→	—	—			100 Trying	IMS_A responds with a 100 Trying provisional response
97B		←	—	—	—	—			INVITE	IMS_A forwards INVITE to UE_A
98B		—	→	—	—	—			100 Trying	UE_A optionally responds with a 100 Trying provisional response
99B	←	—	—	—	—	—				User A is informed that call is resumed
100B		—	→	—	—	—			200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "sendrecv"
101B			—	→	—	—			200 OK	IMS_A forwards 200 OK response to IBCF_A
102B				—	→	—			200 OK	IBCF_A forwards 200 OK response to IBCF_B
103B					—	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
104B					←	—			200 OK	IMS_B forwards 200 OK response to IBCF_B
105B				←	—	—			200 OK	IBCF_B forwards 200 OK response to IBCF_A
106B			←	—	—	—			200 OK	IBCF_A forwards 200 OK response to IMS_A
107B			—	—	—	—	→		200 OK	IMS_A forwards the 200 OK response to UE_B
108B										User B is informed that call is resumed
109	→									User A ends call
110		—	→						BYE	UE_A releases the call with BYE

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
111			→						BYE	IMS_A forwards BYE to IBCF_A
112				→					BYE	IBCF_A forwards BYE to IBCF_B
113					→				BYE	IBCF_B forwards BYE to IMS_B
114					←				BYE	IMS_B forwards BYE to IBCF_B
115				←					BYE	IBCF_B forwards BYE to IBCF_A
116			←						BYE	IBCF_A forwards BYE to IMS_A
117			→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
118							→			User B is informed that call has ended
119			←	←	←	←			200 OK	UE_B sends 200 OK for BYE
120			→						200 OK	IMS_A forwards the 200 OK response to IBCF_A
121				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
122					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
123					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
124				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
125			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
126		←							200 OK	IMS_A forwards the 200 OK response to UE_A
127	←									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	12	18
3	User A is informed that UE_B is ringing	18	27
4	User B answers call	19	28
5	User A is informed that call has been answered	25	37
6	User B is informed that call is established	31	46
7A	User A puts call on hold	32A	47A
7B	User B puts call on hold	32B	47B
8A	User B is informed that call on hold	38A	56A
8B	User A is informed that call on hold	38B	56B
9A	User A resumes call	50A	66A
9B	User B resumes call	50B	66B
10A	User B is informed that call is resumed	56A	75A
10B	User A is informed that call is resumed	56B	75B
11A	User A is informed that call is resumed	62A	84A
11	User A is informed that call is resumed	62B	84B
12	User A ends call	63	85
13	User B is informed that call has ended	69	94
14	User A is informed that call has ended	75	103

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 / IBCF A / IBCF B / 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
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		INVITE	IMS_A forwards INVITE to IBCF_A
5		100 Trying	IBCF_A responds with a 100 Trying provisional response
6		INVITE	IBCF_A forwards INVITE to IBCF_B
7		100 Trying	IBCF_B responds with a 100 Trying provisional response
8		INVITE	IBCF_B forwards INVITE to IMS_B
9		100 Trying	IMS_B responds with a 100 Trying provisional response
10		INVITE	IMS_B forwards INVITE to UE_B
11		100 Trying	UE_B optionally responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
12							→			User B is informed of incoming call of User A
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 IBCF_B
15				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16			←						180 Ringing	IBCF_A forwards 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 IBCF_B
22				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
23			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
24		←							200 OK	IMS_A forwards 200 OK response to UE_A
25	←									User A is informed that call has been answered
26		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27			→						ACK	IMS_A forwards ACK to IBCF_A
28				→					ACK	IBCF_A forwards ACK to IBCF_B
29					→				ACK	IBCF_B forwards ACK to IMS_B
30						→			ACK	IMS_B forwards ACK to UE_B
31							→			User B is presented that call is in progress
32A	→									User A puts call on hold
33A		→							UPDATE	UE_A sends reUPDATE message indicating media attribute "sendonly" (Call Hold)
34A			→						UPDATE	IMS_A forwards UPDATE to IBCF_A
35A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
36A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
37A						→			UPDATE	IMS_B forwards UPDATE to UE_B
38A							→			User B is informed that call is on hold
39A						←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
40A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
41A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
42A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
43A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
44A	→									User A resumes call
45A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
46A			→						UPDATE	IMS_A forwards UPDATE to IBCF_A
47A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
48A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
49A						→			UPDATE	IMS_B forwards UPDATE to UE_B
50A							→			User B is informed that call is resumed
51A						←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
52A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
53A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
54A			←						200 OK	IBCF_A 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
32B							←			User B puts call on hold
33B						←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
34B					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
35B				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
36B			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
37B		←							UPDATE	IMS_A forwards UPDATE to UE_A
38B	←									User A is informed that call is on hold
39B		→							200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "recvonly"
40B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
41B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
42B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
43B							→		200 OK	IMS_B forwards the 200 OK response to UE_B
44B								→		User B is informed that call is on hold
45B						←			ACK	UE_B acknowledges the receipt of 200 OK for UPDATE
46B					←				ACK	IMS_B forwards ACK to IBCF_B
47B				←					ACK	IBCF_B forwards ACK to IBCF_B
48B			←						ACK	IBCF_B forwards ACK to IMS_A
49B		←							ACK	IMS_A forwards ACK to UE_A
50B								←		User B resumes call
51B						←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
52B					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
53B				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
54B			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
55B		←							UPDATE	IMS_A forwards UPDATE to UE_A
56B	←									User A is informed that call is resumed
57B		→							200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
58B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
59B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
62B							→			User B is informed that call is resumed
63	→									User A ends call
64		→							BYE	UE_A releases the call with BYE
65			→						BYE	IMS_A forwards BYE to IBCF_A
66				→					BYE	IBCF_A forwards BYE to IBCF_B
67					→				BYE	IBCF_B forwards BYE to IMS_B
68						→			BYE	IMS_B forwards BYE to UE_B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
69							→			User B is informed that call has ended
70						←			200 OK	UE_B sends 200 OK for BYE
71					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
72				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
73			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
74		←							200 OK	IMS_A forwards the 200 OK response to UE_A
75	←									User A is informed that call has ended

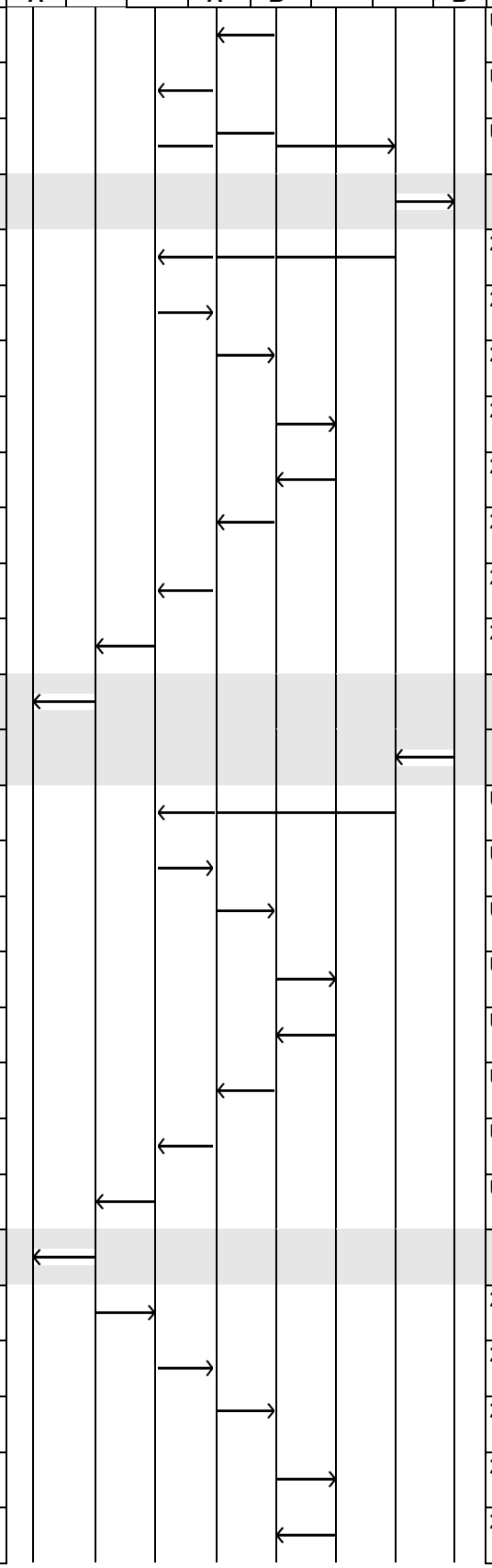
4.4.3.2.3 UC_04_R: SIP Call Flow "call hold and resume" using UPDATE with CF_ROAM_CALL

The expected call flow sequence is:

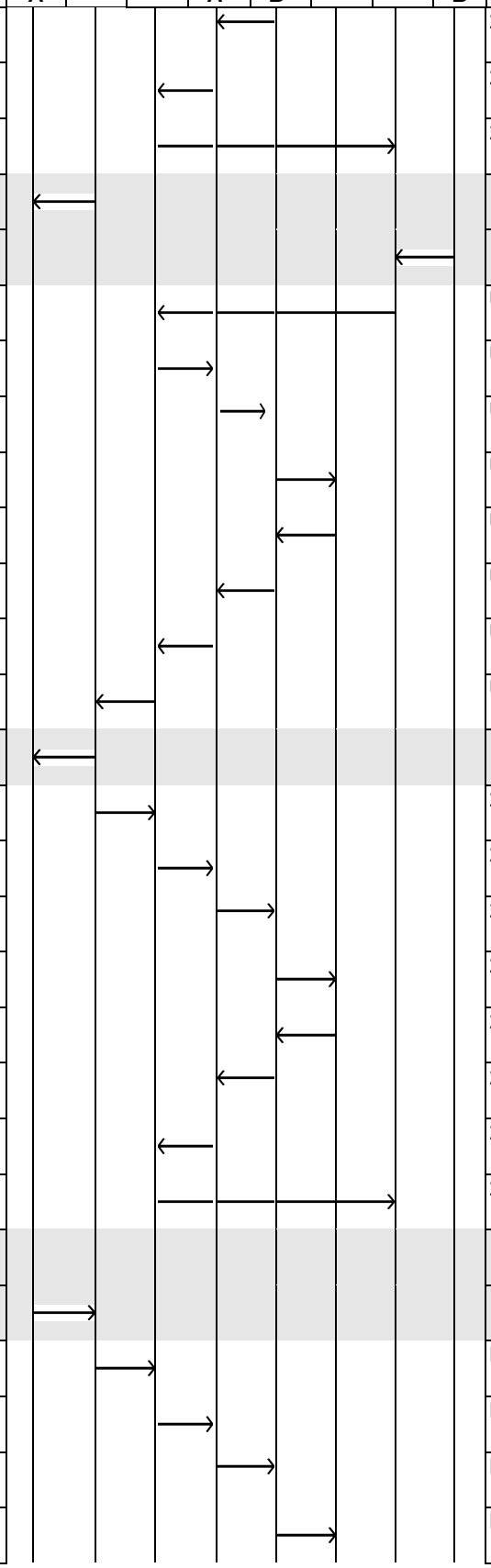
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						INVITE	IMS_A forwards INVITE to IBCF_A
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				INVITE	IMS_B forwards INVITE to IBCF_B
11					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
12				←					INVITE	IBCF_B forwards INVITE to IBCF_A
13				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
14			←						INVITE	IBCF_A forwards INVITE to IMS_A
15			→						100 Trying	IMS_A responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
16									INVITE	IMS_A forwards INVITE to UE_B
17									100 Trying	UE_B optionally responds with a 100 Trying provisional response
18										User B is informed of incoming call of User A
19									180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20									180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
21									180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22									180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23									180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
24									180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25									180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
26									180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
27										User A is informed that UE_B is ringing
28										User B answers call
29									200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
30									200 OK	IMS_A forwards 200 OK response to IBCF_A
31									200 OK	IBCF_A forwards 200 OK response to IBCF_B
32									200 OK	IBCF_B forwards 200 OK response to IMS_B
33									200 OK	IMS_B forwards 200 OK response to IBCF_B
34									200 OK	IBCF_B forwards 200 OK response to IBCF_A
35									200 OK	IBCF_A forwards 200 OK response to IMS_A
36									200 OK	IMS_A forwards 200 OK response to UE_A
37										User A is informed that call has been answered
38									ACK	UE_A acknowledges the receipt of 200 OK for INVITE
39									ACK	IMS_A forwards ACK to IBCF_A
40									ACK	IBCF_A forwards ACK to IBCF_B
41									ACK	IBCF_B forwards ACK to IMS_B
42									ACK	IMS_B forwards ACK to IBCF_B
43									ACK	IBCF_B forwards ACK to IBCF_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
44			←						ACK	IBCF_A forwards ACK to IMS_A
45					→		→		ACK	IMS_B forwards ACK to UE_B
46							→			User B is presented that call is in progress
47A	→									User A puts call on hold
48A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
49A			→						UPDATE	IMS_A forwards UPDATE to IBCF_A
50A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
51A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
52A					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
53A				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
54A			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
55A					→		→		UPDATE	IMS_A forwards UPDATE to UE_B
56A							→			User B is informed that call is on hold
57A			←						200 OK	UE_B responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
58A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
59A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
62A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
63A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
64A		←							200 OK	IMS_A forwards 200 OK response to UE_A
65A	←									User A is informed that call is on hold
66A	→									User A resumes call
67A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
68A			→						UPDATE	IMS_A forwards UPDATE to IBCF_A
69A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
70A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
71A					←				UPDATE	IMS_B forwards UPDATE to IBCF_B



Step	Direction	Message	Comment
	User A / UEA / IMSA / IBCFA / IBCFB / IMSB / UEB / User B		
72A		UPDATE	IBCF_B forwards UPDATE to IBCF_A
73A		UPDATE	IBCF_A forwards UPDATE to IMS_A
74A		UPDATE	IMS_A forwards UPDATE to UE_B
75A			User B is informed that call is resumed
76A		200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
77A		200 OK	IMS_A forwards 200 OK response to IBCF_A
78A		200 OK	IBCF_A forwards 200 OK response to IBCF_B
79A		200 OK	IBCF_B forwards 200 OK response to IMS_B
80A		200 OK	IMS_B forwards 200 OK response to IBCF_B
81A		200 OK	IBCF_B forwards 200 OK response to IBCF_A
82A		200 OK	IBCF_A forwards 200 OK response to IMS_A
83A		200 OK	IMS_A forwards the 200 OK response to UE_A
84A			User B is informed that call has resumed
47B			User B puts call on hold
48B		UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
49B		UPDATE	IMS_A forwards UPDATE to IBCF_A
50B		UPDATE	IBCF_A forwards UPDATE to IBCF_B
51B		UPDATE	IBCF_B forwards UPDATE to IMS_B
52B		UPDATE	IMS_B forwards UPDATE to IBCF_B
53B		UPDATE	IBCF_B forwards UPDATE to IBCF_A
54B		UPDATE	IBCF_A forwards UPDATE to IMS_A
55B		UPDATE	IMS_A forwards UPDATE to UE_A
56B			User A is informed that call is on hold
57B		200 OK	UE_A responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
58B		200 OK	IMS_A forwards 200 OK response to IBCF_A
59B		200 OK	IBCF_A forwards 200 OK response to IBCF_B
60B		200 OK	IBCF_B forwards 200 OK response to IMS_B
61B		200 OK	IMS_B forwards 200 OK response to IBCF_B



Step	Message	Comment
62B	200 OK	IBCF_B forwards 200 OK response to IBCF_A
63B	200 OK	IBCF_A forwards 200 OK response to IMS_A
64B	200 OK	IMS_A forwards 200 OK response to UE_B
65B		User A is informed that call is on hold
66B		User B resumes call
67B	UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
68B	UPDATE	IMS_A forwards UPDATE to IBCF_A
69B	UPDATE	IBCF_A forwards UPDATE to IBCF_B
70B	UPDATE	IBCF_B forwards UPDATE to IMS_B
71B	UPDATE	IMS_B forwards UPDATE to IBCF_B
72B	UPDATE	IBCF_B forwards UPDATE to IBCF_A
73B	UPDATE	IBCF_A forwards UPDATE to IMS_A
74B	UPDATE	IMS_A forwards UPDATE to UE_A
75B		User A is informed that call is resumed
76B	200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
77B	200 OK	IMS_A forwards 200 OK response to IBCF_A
78B	200 OK	IBCF_A forwards 200 OK response to IBCF_B
79B	200 OK	IBCF_B forwards 200 OK response to IMS_B
80B	200 OK	IMS_B forwards 200 OK response to IBCF_B
81B	200 OK	IBCF_B forwards 200 OK response to IBCF_A
82B	200 OK	IBCF_A forwards 200 OK response to IMS_A
83B	200 OK	IMS_A forwards the 200 OK response to UE_B
84B		User B is informed that call is resumed
85		User A ends call
86	BYE	UE_A releases the call with BYE
87	BYE	IMS_A forwards BYE to IBCF_A
88	BYE	IBCF_A forwards BYE to IBCF_B
89	BYE	IBCF_B forwards BYE to IMS_B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
90					←				BYE	IMS_B forwards BYE to IBCF_B
91				←					BYE	IBCF_B forwards BYE to IBCF_A
92			←						BYE	IBCF_A forwards BYE to IMS_A
93				→	→	→	→		BYE	IMS_A forwards BYE to UE_B
94							→			User B is informed that call has ended
95			←	←	←	←			200 OK	UE_B sends 200 OK for BYE
96			→						200 OK	IMS_A forwards the 200 OK response to IBCF_A
97				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
98					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
99					←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
100				←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
101			←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
102		←	←						200 OK	IMS_A forwards the 200 OK response to UE_A
103	←	←								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 7	Step 10
3	Optional: User A is presented a delivery report	Step 13	Step 19

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	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1	→	→								User A sends an instant message to user B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
2		→	→						MESSAGE	UE_A sends MESSAGE to IMS_A
3			→	→					**MESSAGE**	**IMS_A sends MESSAGE to IBCF_A**
4				→	→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5					→	→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
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 IBCF_B**
10				←	←				200 OK	**IBCF_B sends 200 OK to IBCF_A**
11			←	←					**200 OK**	**IBCF_A sends 200 OK to IMS_A**
12		←	←						200 OK	IMS_A sends 200 OK to UE_A
13	←	←								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	IMS A	IBCF A	IBCF B	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 IBCF_A
4				→	→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5					→	→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
6					←	←			MESSAGE	IMS_B sends MESSAGE to IBCF_B
7				←	←				MESSAGE	IBCF_B sends MESSAGE to IBCF_A
8			←	←					MESSAGE	IBCF_A sends MESSAGE to IMS_A
9			→	—	—	→	→		MESSAGE	IMS_A sends MESSAGE to UE_B
10							→	→		User B is informed about the instant message

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
11			←						200 OK	UE_B sends 200 OK to IMS_A
12				→					200 OK	IMS_A sends 200 OK to IBCF_A
13					→				200 OK	IBCF_A sends 200 OK to IBCF_B
14						→			200 OK	IBCF_B sends 200 OK to IMS_B
15						←			200 OK	IMS_B sends 200 OK to IBCF_B
16					←				200 OK	IBCF_B sends 200 OK to IBCF_A
17			←						200 OK	IBCF_A sends 200 OK to IMS_A
18		←							200 OK	IMS_A sends 200 OK to UE_A
19	←									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.

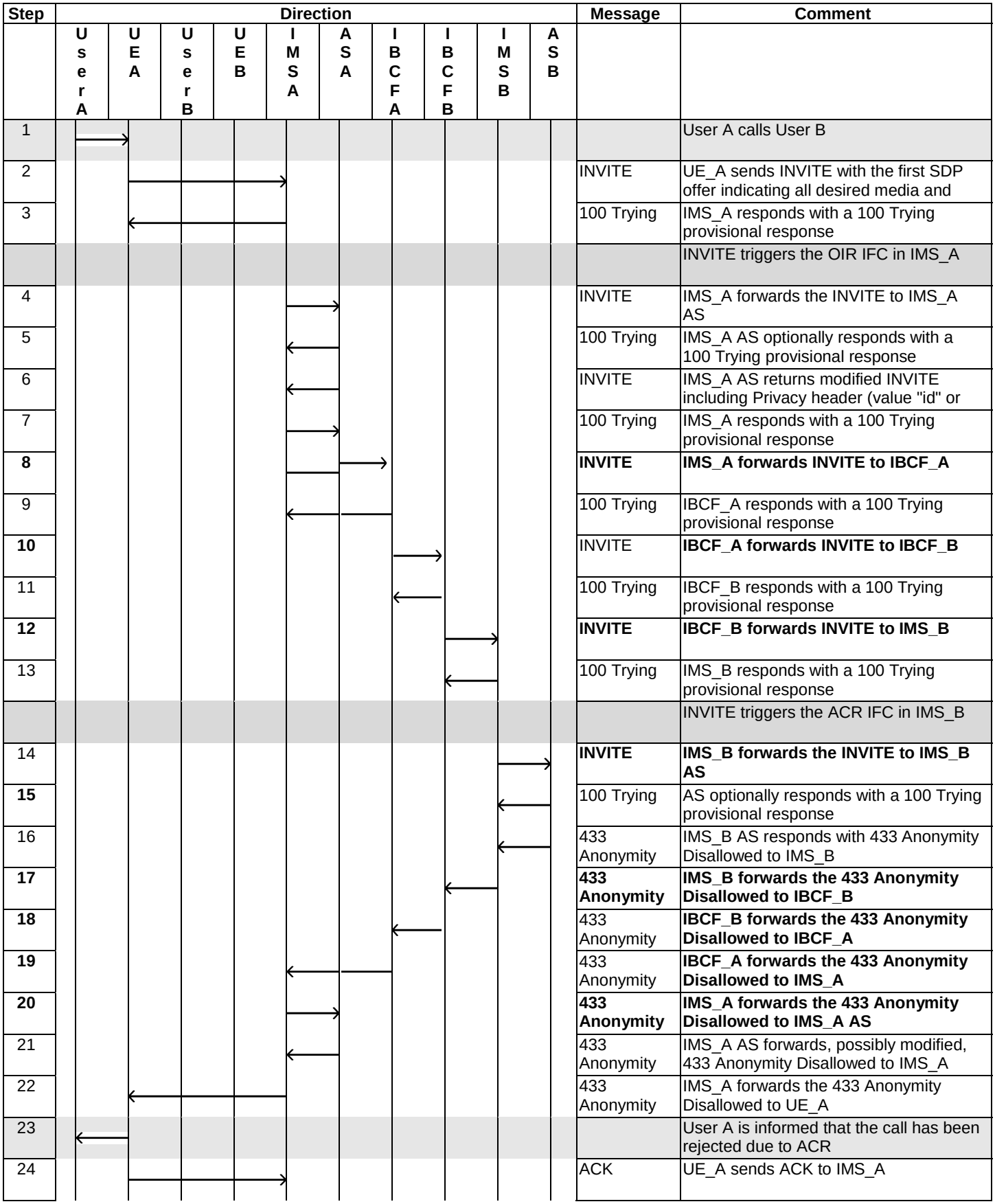
The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

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 23

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 32

4.4.5.2 UC_06_I: SIP message flow for SS ACR with CF_INT_AS

The expected call flow sequence is:



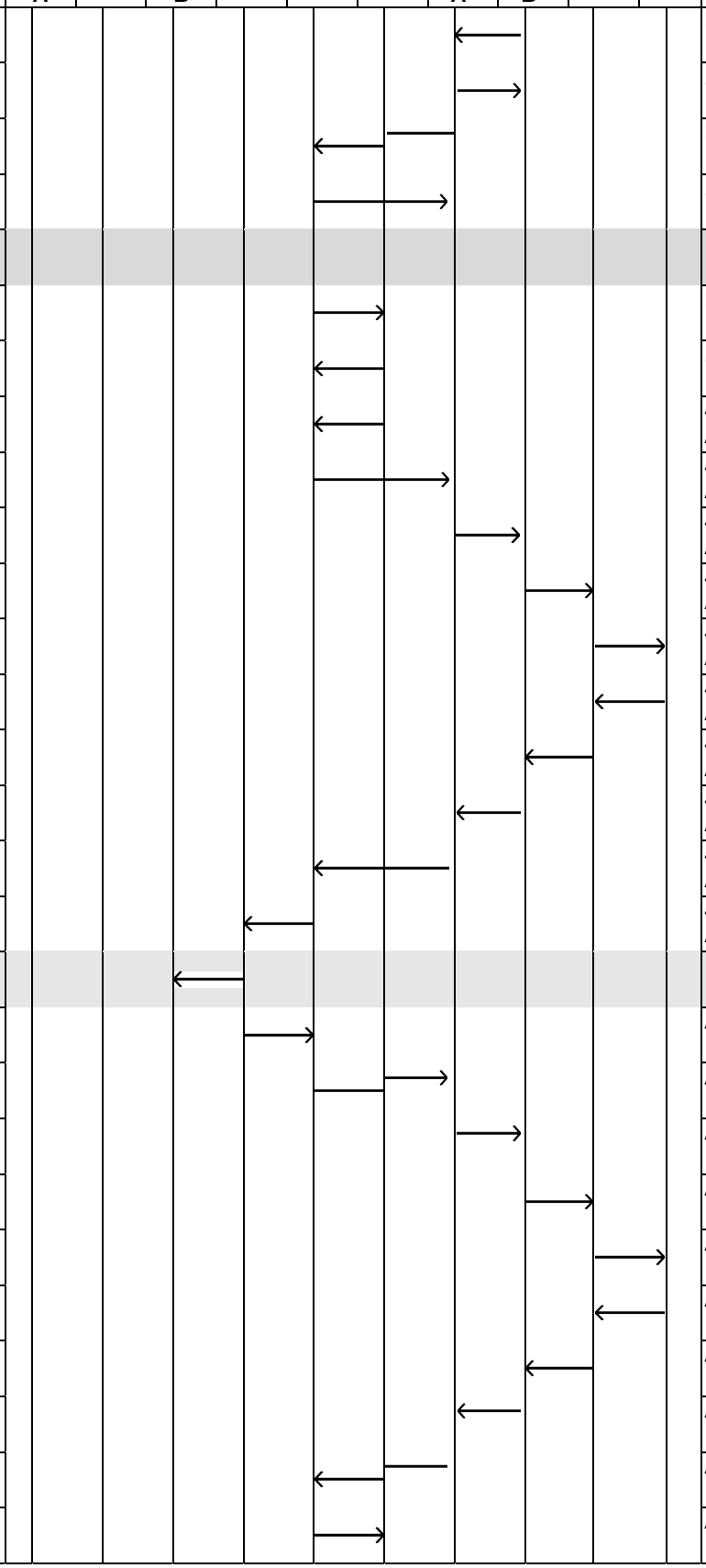
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
1	→											User A calls User B
2		→			→						INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and
3		←			←						100 Trying	IMS_A responds with a 100 Trying provisional 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
7					→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
8						→	→				**INVITE**	**IMS_A forwards INVITE to IBCF_A**
9					←		←				100 Trying	IBCF_A responds with a 100 Trying provisional response
10							→	→			INVITE	**IBCF_A forwards INVITE to IBCF_B**
11							←	←			100 Trying	IBCF_B responds with a 100 Trying provisional response
12								→	→		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
13								←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the ACR IFC in IMS_B
14									→	→	**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
15									←	←	100 Trying	AS optionally responds with a 100 Trying provisional response
16									←	←	433 Anonymity	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
17								←	←		**433 Anonymity**	**IMS_B forwards the 433 Anonymity Disallowed to IBCF_B**
18							←	←			433 Anonymity	**IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A**
19					←		←				433 Anonymity	**IBCF_A forwards the 433 Anonymity Disallowed to IMS_A**
20					←	←					**433 Anonymity**	**IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS**
21					←	←					433 Anonymity	IMS_A AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_A
22		←			←						433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_A
23	←											User A is informed that the call has been rejected due to ACR
24		→			→						ACK	UE_A sends ACK to IMS_A

Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
25					→						ACK	IMS_A forwards the ACK to IMS_A AS
26					←						ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
27					→	→					ACK	IMS_A forwards ACK to IBCF_A
28							→				ACK	IBCF_A forwards ACK to IBCF_B
29								→			ACK	IBCF_B forwards ACK to IMS_B
30									→		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	IBCF A	IBCF B	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**
3				←							100 Trying	IMS_A responds with a 100 Trying provisional response
4					→	→					**INVITE**	**IMS_A sends INVITE to IBCF_A**
5					←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6							→				INVITE	IBCF_A sends INVITE to IBCF_B
7							←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8								→			INVITE	IBCF_B sends INVITE to IMS_B
9								←			100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the OIR 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 Privacy header (value "id" or
13									→		100 Trying	IMS_B responds with a 100 Trying provisional response
14								←			INVITE	IMS_B forwards INVITE to IBCF_B
15								→			100 Trying	IBCF_B responds with a 100 Trying provisional response



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
16							←				INVITE	IBCF_B forwards INVITE to IBCF_A
17							→				100 Trying	IBCF_A responds with a 100 Trying provisional response
18						←					INVITE	IBCF_A forwards INVITE to IMS_A
19					→						100 Trying	IMS_A responds with a 100 Trying provisional response
												INVITE triggers the ACR IFC in IMS_A
20					→						INVITE	IMS_A forwards the INVITE to IMS_A AS
21					←						100 Trying	AS optionally responds with a 100 Trying provisional response
22					←						433 Anonymity	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
23						→					433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to IBCF_A
24							→				433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IBCF_B
25								→			433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IMS_B
26									→		433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IMS_B AS
27									←		433 Anonymity	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
28								←			433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IBCF_B
29							←				433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A
30						←					433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IMS_A
31					←						433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_B
32				←								User B is informed that the call has been rejected due to ACR
33					→						ACK	UE_B sends ACK to IMS_A
34						→					ACK	IMS_A sends ACK to IBCF_A
35							→				ACK	IBCF_A sends ACK to IBCF_B
36								→			ACK	IBCF_B sends ACK to IMS_B
37									→		ACK	IMS_B forwards the ACK to IMS_B AS
38									←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
39								←			ACK	IMS_B forwards ACK to IBCF_B
40							←				ACK	IBCF_B forwards ACK to IBCF_A
41						←					ACK	IBCF_A forwards ACK to IMS_A
42					→						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 12	Step 17

4.4.6.2 UC_07_I: SIP message flow for SS OCB with CF_INT_AS

The expected call flow sequence is:

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

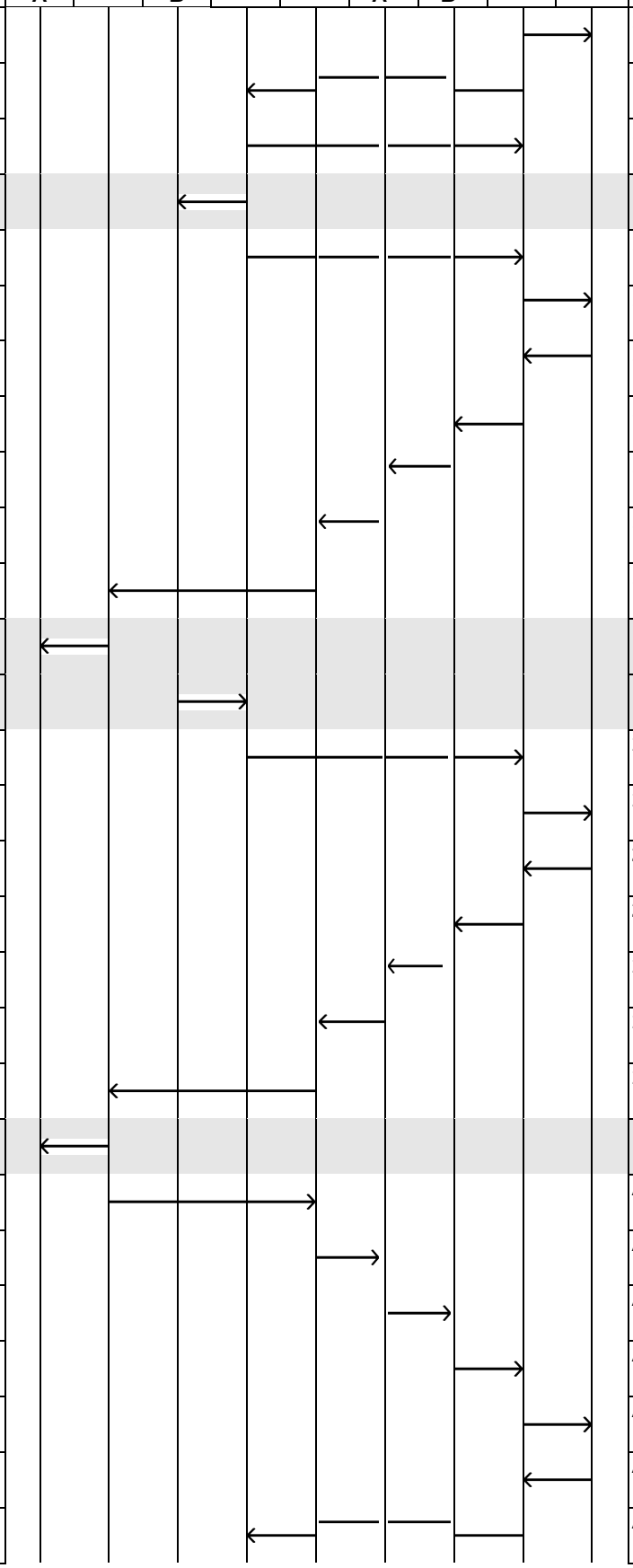
The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

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 16	Step 22
3	User A is informed that UE_B is ringing	Step 24	Step 33
4	User B answers call	Step 25	Step 34
5	User A is informed that call has been answered	Step 33	Step 45
6	User B is informed that the call is established	Step 41	Step 56
7	User A ends call	Step 42	Step 57
8	User B is informed that call has ended	Step 50	Step 68
9	User A is informed that call has ended	Step 58	Step 79

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	Message	Comment
	User A / UE A / User B / UE B / IMS A / IBCF A / IBCF B / 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 IBCF_A**
5		**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
6		**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7		**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
8		**INVITE**	**IBCF_B forwards 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	AS optionally responds with a 100 Trying provisional response
12		INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B



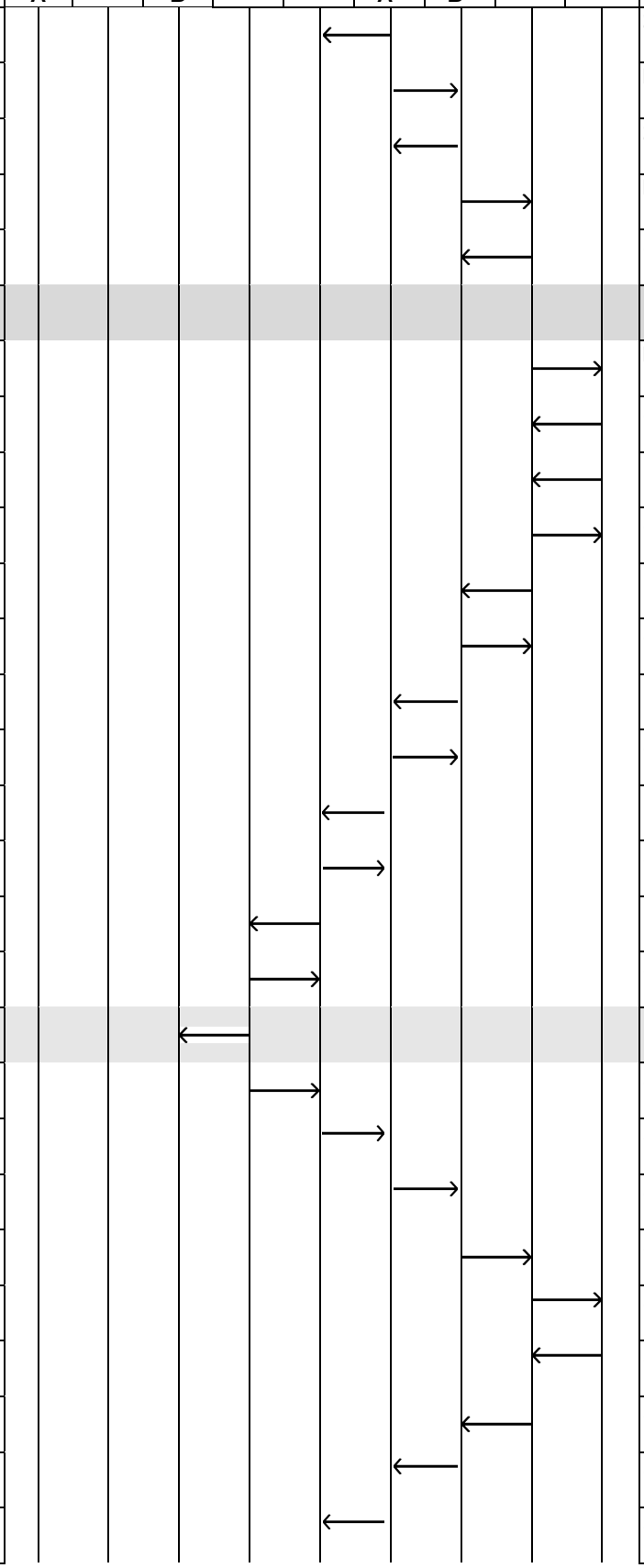
Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS B		
13										100 Trying	IMS_B responds with a 100 Trying provisional response
14										INVITE	IMS_B forwards the INVITE to UE_B
15										100 Trying	UE_B optionally responds with a 100 Trying provisional response
16											User B is informed of incoming call of User A, User A's identity is 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 180 Ringing response to IMS_B AS
19										180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
20										180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
21										180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
22										180 Ringing	IBCF_A forwards the 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 200 OK response to IMS_B AS
28										**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
29										**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
30										200 OK	IBCF_B forwards the 200 OK response to IBCF_A
31										200 OK	IBCF_A forwards the 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
34										ACK	UE_A acknowledges the receipt of 200 OK for INVITE
35										ACK	IMS_A forwards ACK to IBCF_A
36										ACK	IBCF_A forwards ACK to IBCF_B
37										ACK	IBCF_B forwards ACK to IMS_B
38										ACK	IMS_B forwards ACK to IMS_B AS
39										ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
40										ACK	IMS_B forwards ACK to UE_B

Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS B		
41			←								User B is informed that the call is established
42	→										User A ends call
43		→			→					BYE	UE_A releases the call with BYE
44					→					BYE	IMS_A forwards BYE to IBCF_A
45						→				BYE	IBCF_A forwards BYE to IBCF_B
46							→			BYE	IBCF_B forwards BYE to IMS_B
47								→		BYE	IMS_B forwards BYE to IMS_B AS
48								←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
49				←						BYE	IMS_B forwards BYE to UE_B
50			←								User B is informed that call has ended
51								→		200 OK	UE_B sends 200 OK for BYE
52									→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
53									←	200 OK	IMS_B AS forwards 200 OK response to IMS_B
54								←		200 OK	IMS_B forwards 200 OK response to IBCF_B
55							←			200 OK	IBCF_B forwards 200 OK response to IBCF_A
56						←				200 OK	IBCF_A forwards 200 OK response to IMS_A
57		←			←					200 OK	IMS_A forwards 200 OK response to UE_A
58	←										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	IBCF A	IBCF B	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**
3		←			←					100 Trying	IMS_A responds with a 100 Trying provisional response
4					→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**



Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	ASB		
5					←					**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
6						→				**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7						←				**100 Trying**	**IBCF_B 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 OIP 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								←		INVITE	IMS_B AS returns, possibly modified, INVITE 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_B forwards INVITE to IBCF_B
17						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
18					←					INVITE	IBCF_B forwards INVITE to IBCF_A
19					→					100 Trying	IBCF_A responds with a 100 Trying provisional response
20				←						INVITE	IMS_A forwards the INVITE to UE_B
21				→						100 Trying	UE_B optionally responds with a 100 Trying provisional response
22			←								User B is informed of incoming call of User A, User A's identity is displayed
23				→						180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
24					→					180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
25						→				180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
26							→			180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
27								→		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
28								←		180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
29							←			180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
30						←				180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
31					←					180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A

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

Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
60										BYE	IBCF_A forwards BYE to IBCF_B
61										BYE	IBCF_B forwards BYE to IMS_B
62										BYE	IMS_B forwards BYE to IMS_B AS
63										BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B
64										BYE	IMS_B forwards BYE to IBCF_B
65										BYE	IBCF_B forwards BYE to IBCF_A
66										BYE	IBCF_A forwards BYE to IMS_A
67										BYE	IMS_A forwards BYE to UE_B
68											User B is informed that call has ended
69										200 OK	UE_B sends 200 OK for BYE
70										200 OK	IMS_A forwards 200 OK to IBCF_A
71										200 OK	IBCF_A forwards 200 OK to IBCF_B
72										200 OK	IBCF_B forwards 200 OK to IMS_B
73										200 OK	IMS_B forwards 200 OK to IMS_B AS
74										200 OK	IMS_B AS forwards 200 OK response to IMS_B
75										200 OK	IMS_B forwards 200 OK response to IBCF_B
76										200 OK	IBCF_B forwards 200 OK response to IBCF_A
77										200 OK	IBCF_A forwards 200 OK response to IMS_A
78										200 OK	IMS_A forwards 200 OK response to UE_A
79											User A is informed that call has ended

4.4.8 Supplementary Service Originating Identification Restriction (OIR)

4.4.8.1 Description

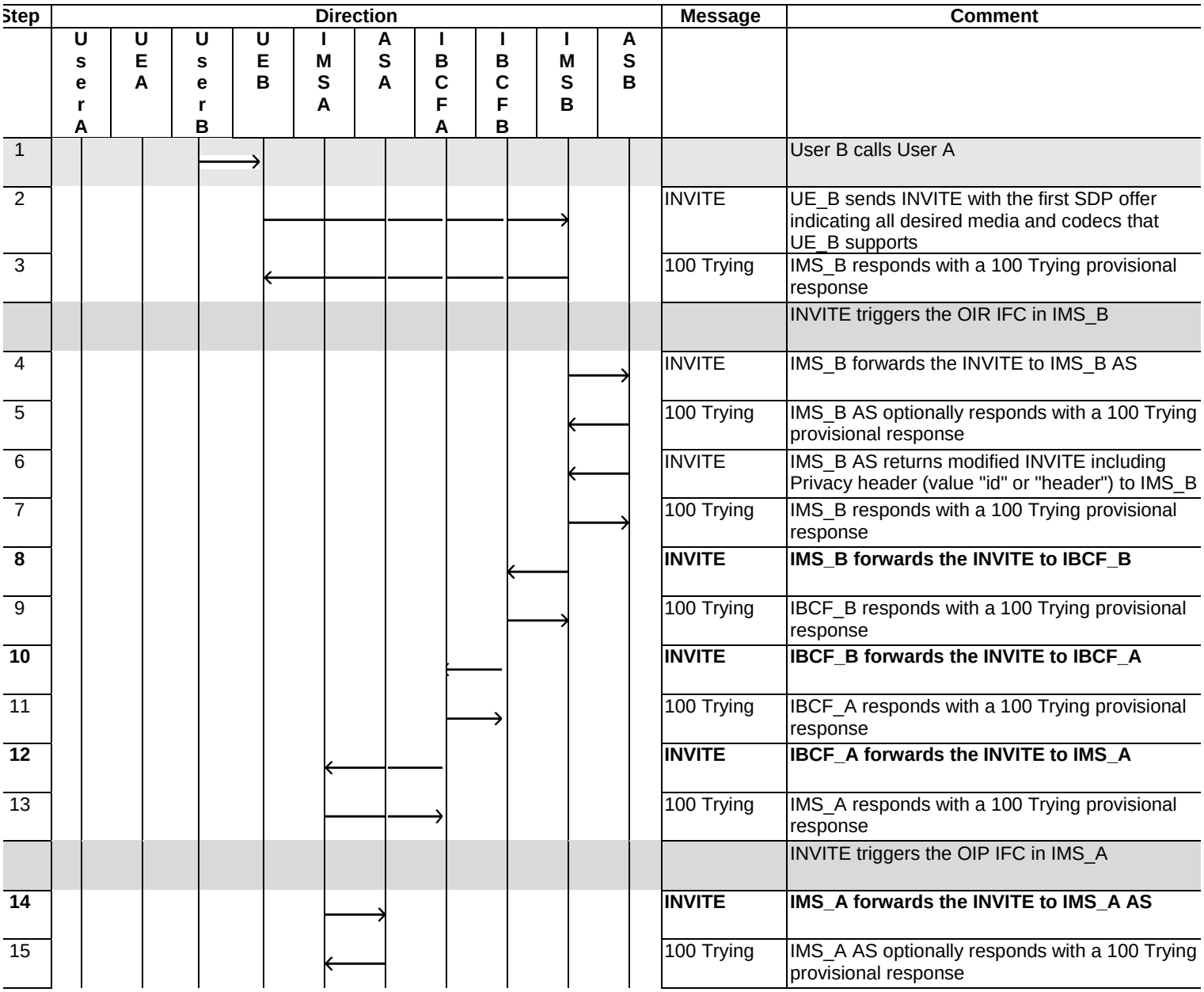
UE_B places an IMS VoIP call to UE_A. UE_A is subscribed to OIP service, UE_B is subscribed to OIR service in permanent mode or default presentation restricted temporary mode. The call flow path and node configuration for this use case corresponds to CF_INT_AS when UE_B is in home network and to CF_ROAM_AS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

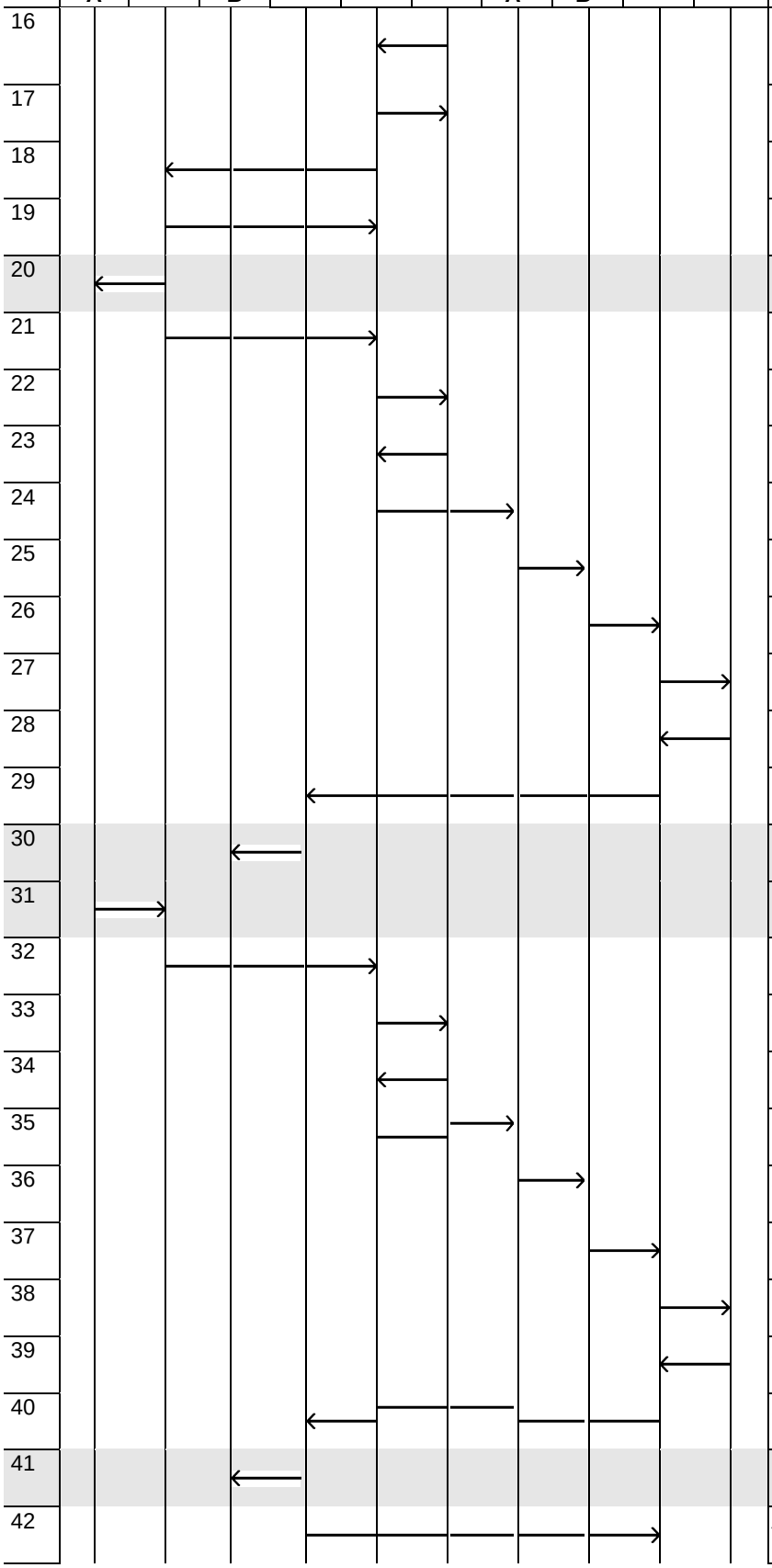
Step	Action	CF_INT_AS	CF_ROAM_AS
1	User B calls User A	Step 1	Step 1
2	User A is informed of incoming call of User B, user B's identity is not displayed	Step 20	Step 26
3	User B is informed that UE_A is ringing	Step 30	Step 39
4	User A answers call	Step 31	Step 40
5	User B is informed that call has been answered	Step 41	Step 53
6	User A is informed that the call is established	Step 49	Step 64
7	User A ends call	Step 50	Step 65
8	User B is informed that call has ended	Step 60	Step 78
9	User A is informed that call has ended	Step 68	Step 89

4.4.8.2 UC_09_I: SIP message flow for SS OIR with CF_INT_AS

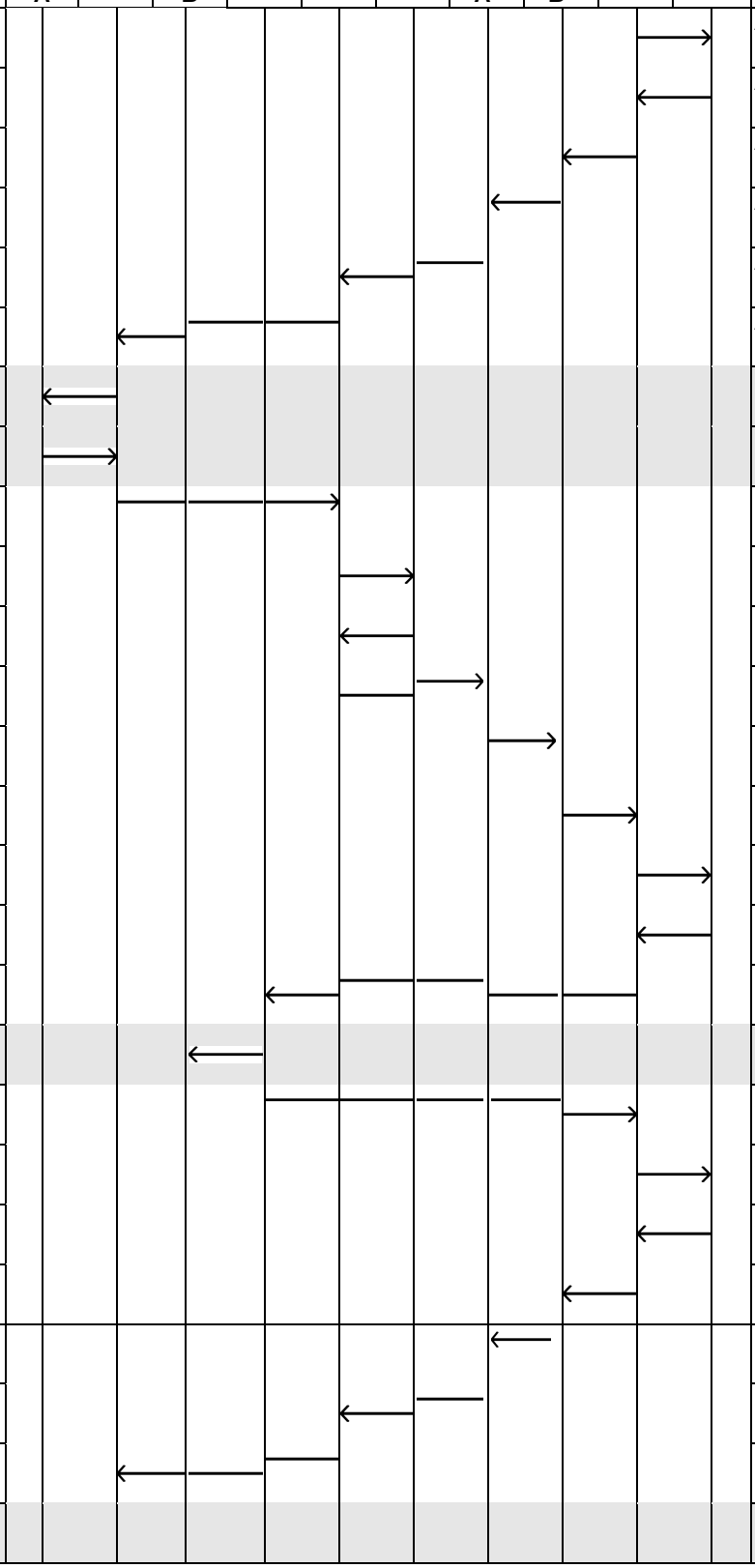
The expected call flow sequence is:



Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / AS A / IBCF A / IBCF B / 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 IBCF_B**
9		100 Trying	IBCF_B responds with a 100 Trying provisional response
10		**INVITE**	**IBCF_B forwards the INVITE to IBCF_A**
11		100 Trying	IBCF_A responds with a 100 Trying provisional response
12		**INVITE**	**IBCF_A forwards the INVITE to IMS_A**
13		100 Trying	IMS_A responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_A
14		**INVITE**	**IMS_A forwards the INVITE to IMS_A AS**
15		100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response



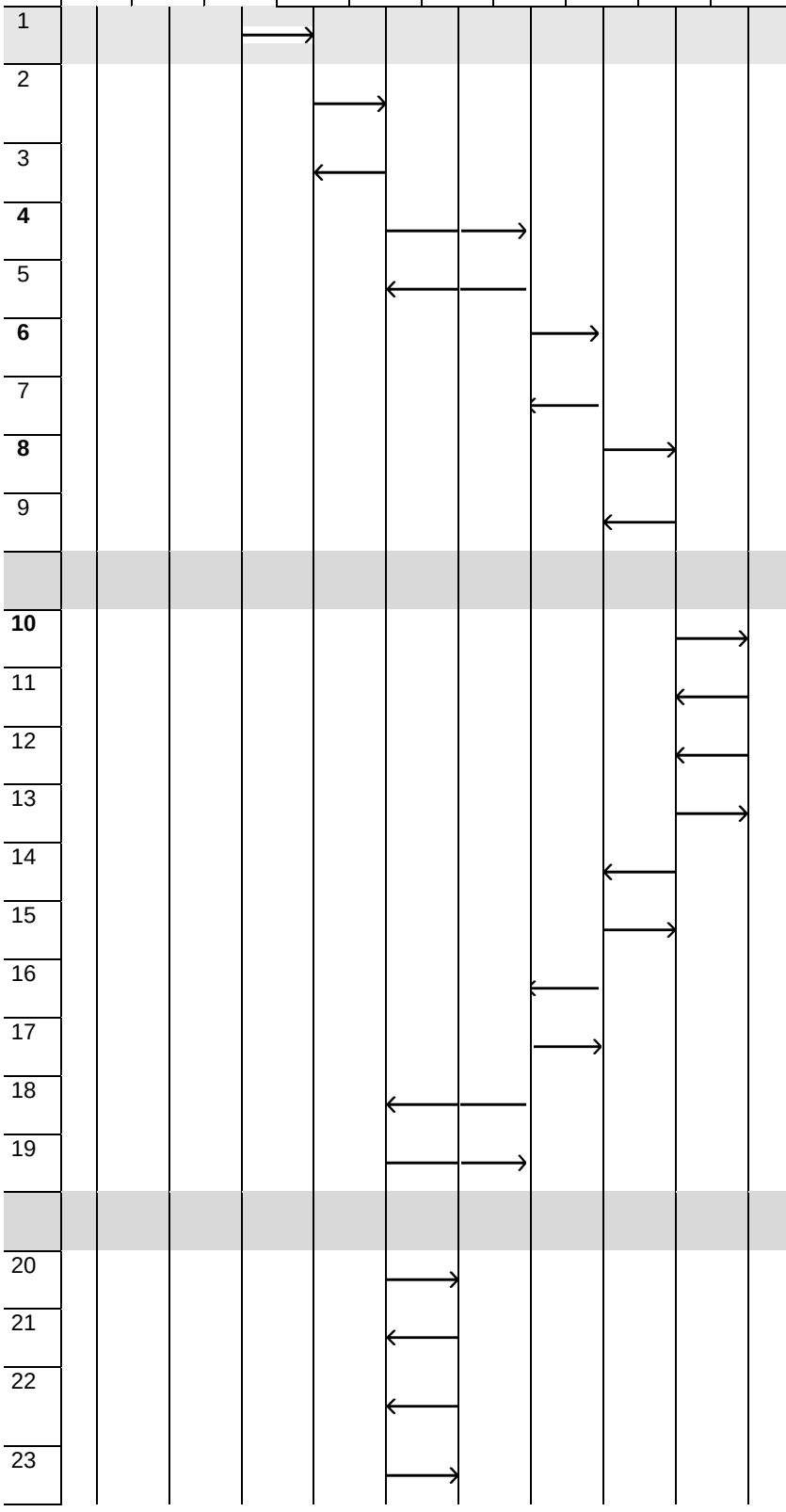
Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / AS A / IBCF A / IBCF B / IMS B / AS B		
16		INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
17		100 Trying	IMS_A responds with a 100 Trying provisional response
18		INVITE	IMS_A forwards the INVITE to UE_A
19		100 Trying	UE_A optionally responds with a 100 Trying provisional response
20			User A is informed of incoming call of User B, user B's identity is not displayed
21		180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
22		180 Ringing	IMS_A forwards the 180 Ringing to IMS_A AS
23		180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
24		180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
25		180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
26		180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
27		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
28		180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
29		180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
30			User B is informed that UE_A is ringing
31			User A answers call
32		200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
33		200 OK	IMS_A forwards the 200 OK to IMS_A AS
34		200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
35		200 OK	IMS_A forwards 200 OK response to IBCF_A
36		200 OK	IBCF_A forwards 200 OK response to IBCF_B
37		200 OK	IBCF_B forwards 200 OK response to IMS_B
38		200 OK	IMS_B forwards 200 OK response to IMS_B AS
39		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
40		200 OK	IMS_B forwards the 200 OK response to UE_B
41			User B is informed that call has been answered
42		ACK	UE_B acknowledges the receipt of 200 OK for INVITE



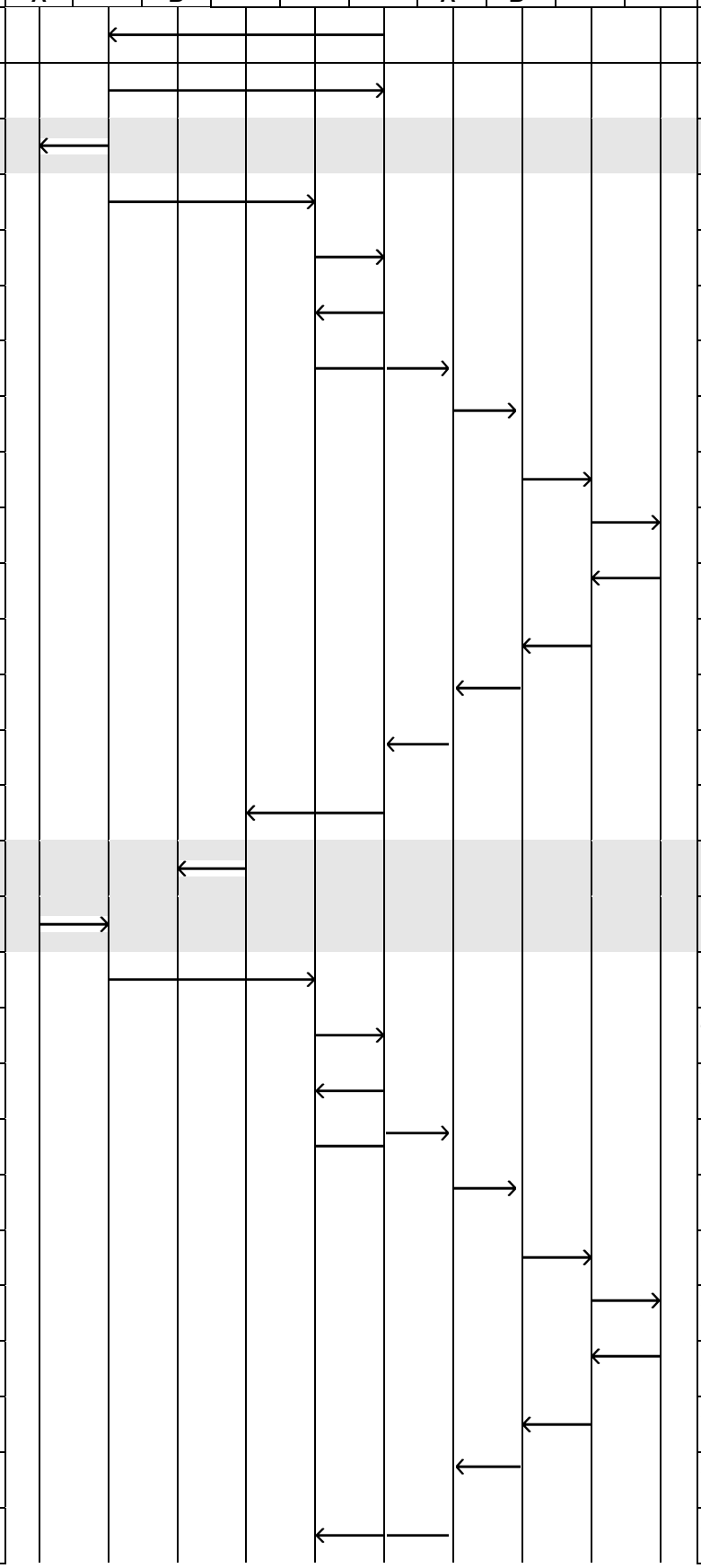
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
43									→		ACK	IMS_B forwards ACK to IMS_B AS
44									←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
45								←			ACK	IMS_B forwards ACK to IBCF_B
46							←				ACK	IBCF_B forwards ACK to IBCF_A
47						←					ACK	IBCF_A forwards ACK to IMS_A
48		←									ACK	IMS_A forwards ACK to UE_A
49	←											User A is informed that the call is established
50	→											User A ends call
51		→		→							BYE	UE_A releases the call with BYE
52					→						BYE	IMS_A forwards BYE to IMS_A AS
53					←						BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
54						→					BYE	IMS_A forwards BYE to IBCF_A
55							→				BYE	IBCF_A forwards BYE to IBCF_B
56								→			BYE	IBCF_B forwards BYE to IMS_B
57									→		BYE	IMS_B forwards BYE to IMS_B AS
58									←		BYE	IMS_B AS 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 200 OK response to IMS_B AS
63									←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
64								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
65							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
66						←					200 OK	IBCF_A forwards 200 OK response to IMS_A
67		←									200 OK	IMS_A forwards 200 OK response to UE_A
68												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

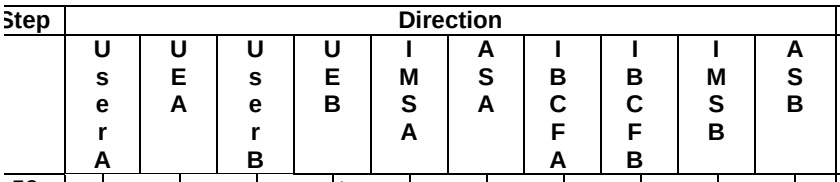
The expected call flow sequence is:



Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / AS A / IBCF A / IBCF B / 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 IBCF_A**
5		100 Trying	IBCF_A responds with a 100 Trying provisional response
6		**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7		100 Trying	IBCF_B responds with a 100 Trying provisional response
8		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the OIR 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 Privacy header (value "id" or "header") to IMS_B
13		100 Trying	IMS_B responds with a 100 Trying provisional response
14		INVITE	IMS_B forwards the INVITE to IBCF_B
15		100 Trying	IBCF_B responds with a 100 Trying provisional response
16		INVITE	IBCF_B forwards the INVITE to IBCF_A
17		100 Trying	IBCF_A responds with a 100 Trying provisional response
18		INVITE	IMS_B forwards the INVITE to IMS_A
19		100 Trying	IMS_A responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_A
20		INVITE	IMS_A forwards the INVITE to IMS_A AS
21		100 Trying	IMS A AS optionally responds with a 100 Trying provisional response
22		INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
23		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	ASA	IBCF A	IBCF B	IMS B	AS B		
24		←				←					INVITE	IMS_A forwards the INVITE to UE_A
25		→				→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
26	←											User A is informed of incoming call of User B, user B's identity is not displayed
27		→		→	→						180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
28						**→**					**180 Ringing**	**IMS_A forwards the 180 Ringing to IMS_A AS**
29						←					180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
30						→	→				180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
31							→	→			180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
32								→	→		180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
33									→	→	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
34									←	←	180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
35								←	←		180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
36							←	←			180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
37						←	←				180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
38				←	←	←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
39			←	←								User B is informed that UE_A is ringing
40	→											User A answers call
41		→		→	→						200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
42						**→**					**200 OK**	**IMS_A forwards the 200 OK to IMS_A AS**
43						←					200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
44						→	→				200 OK	IMS_A forwards 200 OK response to IBCF_A
45							→	→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
46								→	→		200 OK	IBCF_B 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, possibly modified, 200 OK response to IMS_B
49								←	←		200 OK	IMS_B forwards the 200 OK response to IBCF_B
50							←	←			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
51					←	←					200 OK	IBCF_A forwards the 200 OK response to IMS_A



Step	Message	Comment
52	200 OK	IMS_A forwards the 200 OK response to UE_B
53		User B is informed that call has been answered
54	ACK	UE_B acknowledges the receipt of 200 OK for INVITE
55	ACK	IMS_A forwards ACK to IBCF_A
56	ACK	IBCF_A forwards ACK to IBCF_B
57	ACK	IBCF_B forwards ACK to IMS_B
58	ACK	IMS_B forwards ACK to IMS_B AS
59	ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
60	ACK	IMS_B forwards ACK to IBCF_B
61	ACK	IBCF_B forwards ACK to IBCF_A
62	ACK	IBCF_A forwards ACK to IMS_A
63	ACK	IMS_A forwards ACK to UE_A
64		User A is informed that the call is established
65		User A ends call
66	BYE	UE_A releases the call with BYE
67	BYE	IMS_A forwards BYE to IMS_A AS
68	BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
69	BYE	IMS_A forwards BYE to IBCF_A
70	BYE	IBCF_A forwards BYE to IBCF_B
71	BYE	IBCF_B forwards BYE to IMS_B
72	BYE	IMS_B forwards BYE to IMS_B AS
73	BYE	IMS_B AS forwards BYE to IMS_B
74	BYE	IMS_B forwards BYE to IBCF_B
75	BYE	IBCF_B forwards BYE to IBCF_A
76	BYE	IBCF_A forwards BYE to IMS_A
77	BYE	IMS_A forwards BYE to UE_B
78		User B is informed that call has ended
79	200 OK	UE_B sends 200 OK for BYE

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
80											200 OK	IMS_A forwards 200 OK response to IBCF_A
81											200 OK	IBCF_A forwards 200 OK response to IBCF_B
82											200 OK	IBCF_B forwards 200 OK response to IMS_B
83											200 OK	IMS_B forwards 200 OK response to IMS_B AS
84											200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
85											200 OK	IMS_B forwards 200 OK response to IBCF_B
86											200 OK	IBCF_B forwards 200 OK response to IBCF_A
87											200 OK	IBCF_A forwards 200 OK response to IMS_A
88											200 OK	IMS_A forwards 200 OK response to UE_A
89												User A is informed that call has ended

4.4.9 Supplementary Service HOLD

4.4.9.1 Description

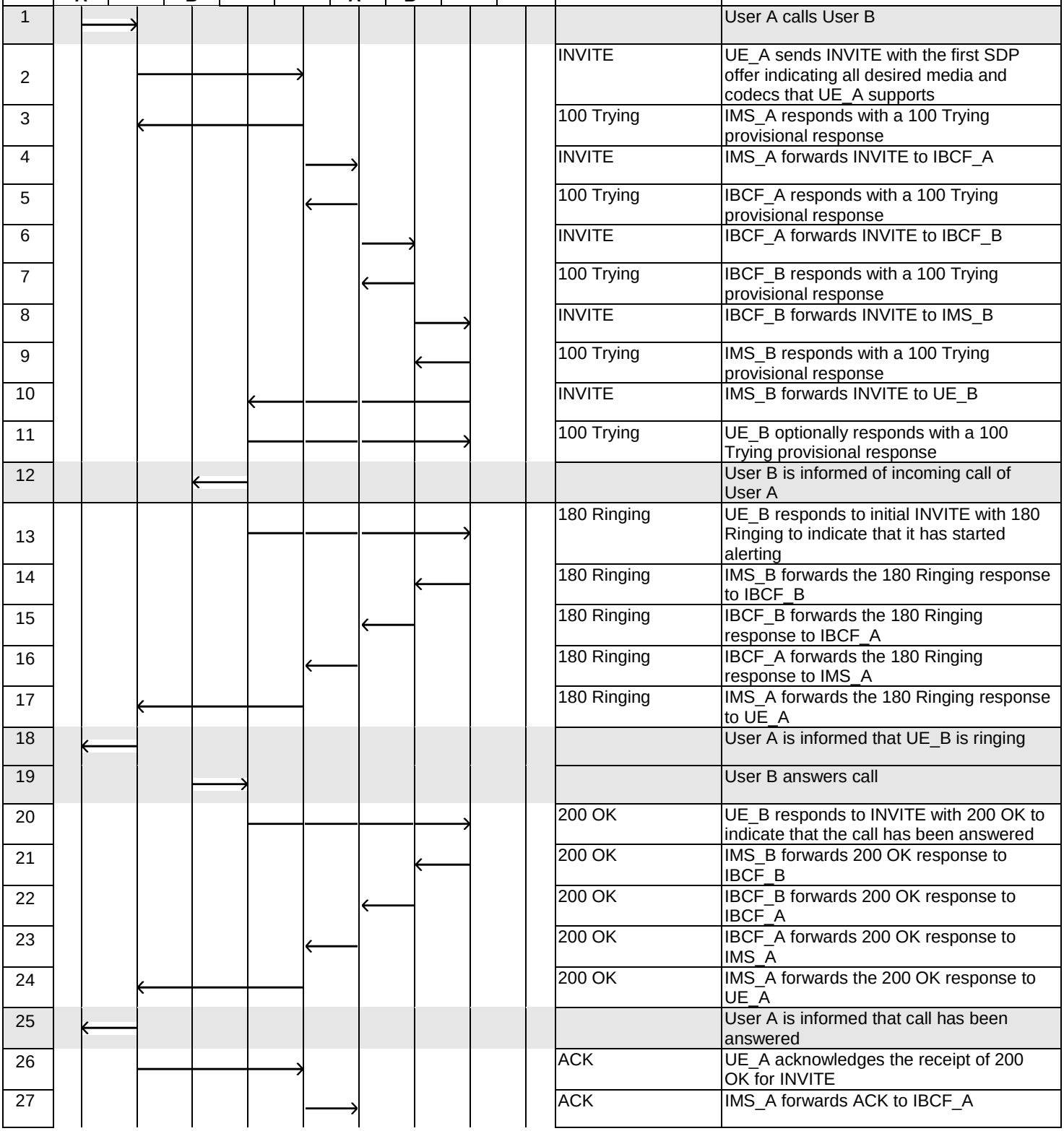
UE_A places an IMS VoIP call to UE_B which places the call on HOLD. UE_A will be notified by the AS that the call is on hold. UE_B will resume the call, and UE_A will be informed by the AS that the call is resumed.

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	12	18
3	User A is informed that UE_B is ringing	18	27
4	User B answers call	19	28
5	User A is informed that call has been answered	25	37
6	User B is informed that call is established	31	46
7	User B puts call on hold	32	47
8	User A is informed that call on hold with AS tone	47	68
9	User B is informed that call on hold	55	79
10	User B resumes call	63	90
11	User B is informed that call is resumed	85	121
12	User A is informed that call is resumed	93	132
13	User A ends call	94	133
14	User B is informed that call has ended	100	142
15	User A is informed that call has ended	106	151

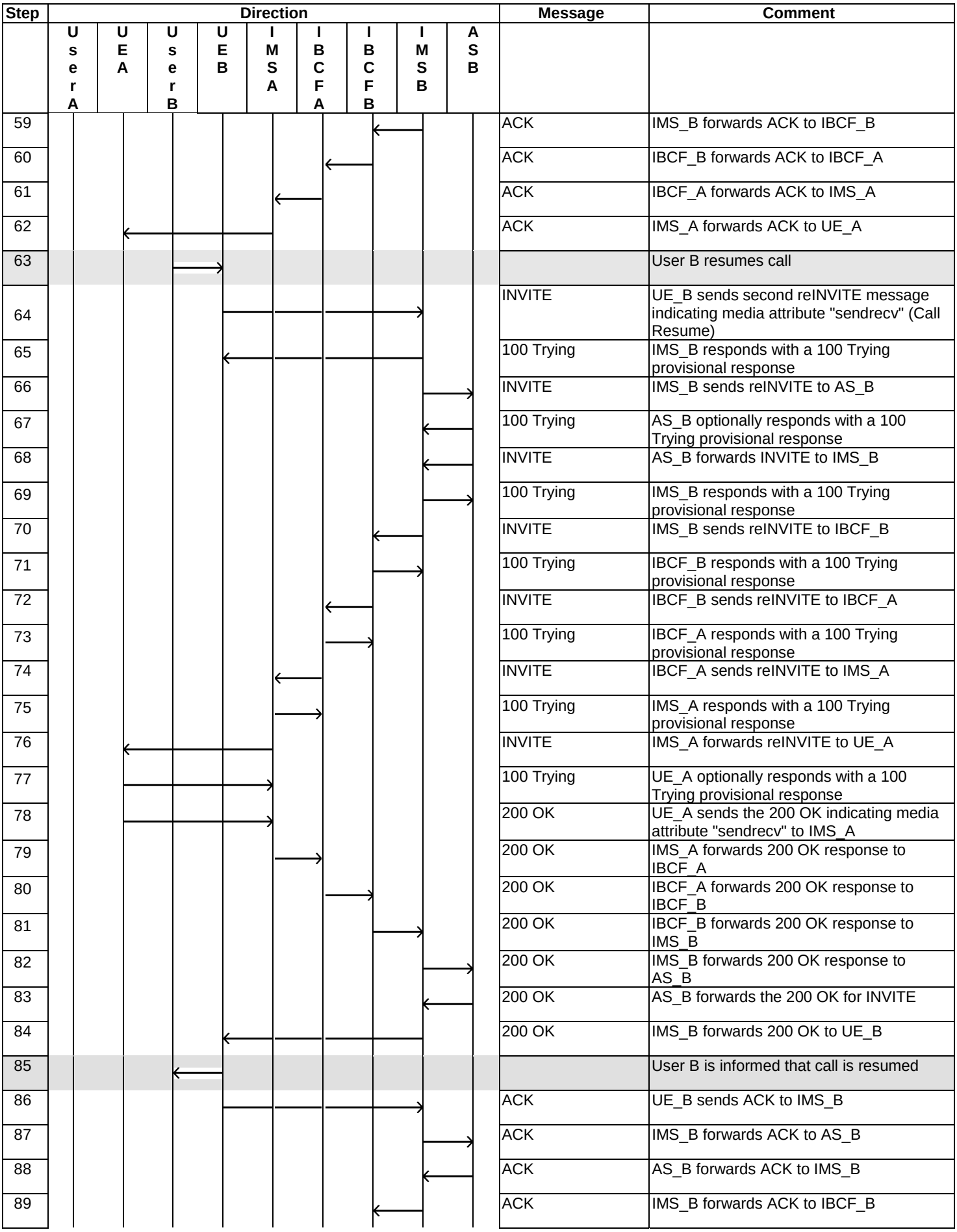
4.4.9.1.1 UC_10_I: SIP Call Flow "call hold and resume with AS tone" using reINVITE with CF_INT_AS

The expected call flow sequence is:



Step	Direction	Message	Comment
	User A / UEA / User B / UEB / IMSA / IBCFA / IBCFB / IMSB / ASB		
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 IBCF_A
5		100 Trying	IBCF_A responds with a 100 Trying provisional response
6		INVITE	IBCF_A forwards INVITE to IBCF_B
7		100 Trying	IBCF_B responds with a 100 Trying provisional response
8		INVITE	IBCF_B forwards INVITE to IMS_B
9		100 Trying	IMS_B responds with a 100 Trying provisional response
10		INVITE	IMS_B forwards INVITE to UE_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
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 the 180 Ringing response to IBCF_B
15		180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
16		180 Ringing	IBCF_A 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 to INVITE with 200 OK to indicate that the call has been answered
21		200 OK	IMS_B forwards 200 OK response to IBCF_B
22		200 OK	IBCF_B forwards 200 OK response to IBCF_A
23		200 OK	IBCF_A forwards 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
26		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27		ACK	IMS_A forwards ACK to IBCF_A

Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS B		
28						←				ACK	IBCF_A forwards ACK to IBCF_B
29							←			ACK	IBCF_B forwards ACK to IMS_B
30				←						ACK	IMS_B forwards ACK to UE_B
31			←								User B is informed that call is established
32			→								User B puts call on hold
33				→				←		INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
34				←						100 Trying	IMS_B responds with a 100 Trying provisional response
35								→		INVITE	IMS_B sends reINVITE to AS_B
36								←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
37								←		INVITE	AS_B sends reINVITE to IMS_B
38								→		100 Trying	IMS_B responds with a 100 Trying provisional response
39							←			INVITE	IMS_B forwards reINVITE to IBCF_B
40							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
41						←				INVITE	IBCF_B forwards reINVITE to IBCF_A
42						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
43					←					INVITE	IBCF_A forwards reINVITE to IMS_A
44					→					100 Trying	IMS_A responds with a 100 Trying provisional response
45		←								INVITE	IMS_A forwards reINVITE to UE_A
46		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
47	←										User A is informed that call is on hold with AS tone
48		→								200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
49					→					200 OK	IMS_A forwards 200 OK response to IBCF_A
50						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
51							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
52								→		200 OK	IMS_B forwards 200 OK response to AS_B
53								←		200 OK	AS_B forwards 200 OK response to IMS_B
54				←						200 OK	IMS_b forward the 200 OK to UE_B
55			←								User B is informed that the call is on hold
56				→				←		ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
57								→		ACK	IMS_B forwards ACK to AS_B
58								←		ACK	AS_B forwards ACK to IMS_B



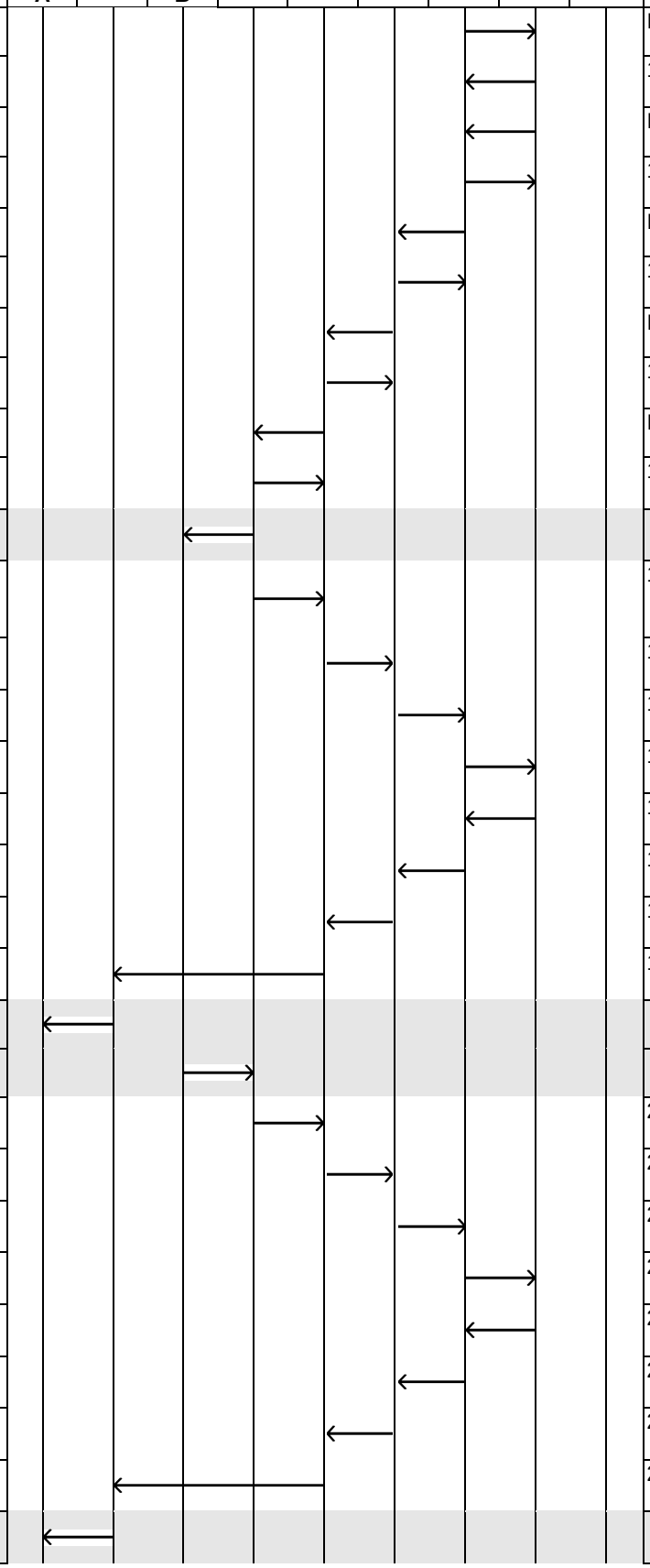
Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS B		
59							←			ACK	IMS_B forwards ACK to IBCF_B
60						←				ACK	IBCF_B forwards ACK to IBCF_A
61					←					ACK	IBCF_A forwards ACK to IMS_A
62		←								ACK	IMS_A forwards ACK to UE_A
63			→								User B resumes call
64				→				→		INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
65				←						100 Trying	IMS_B responds with a 100 Trying provisional response
66								→		INVITE	IMS_B sends reINVITE to AS_B
67								←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
68								←		INVITE	AS_B forwards INVITE to IMS_B
69								→		100 Trying	IMS_B responds with a 100 Trying provisional response
70							←			INVITE	IMS_B sends reINVITE to IBCF_B
71							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
72						←				INVITE	IBCF_B sends reINVITE to IBCF_A
73						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
74					←					INVITE	IBCF_A sends reINVITE to IMS_A
75					→					100 Trying	IMS_A responds with a 100 Trying provisional response
76		←								INVITE	IMS_A forwards reINVITE to UE_A
77		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
78		→								200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
79					→					200 OK	IMS_A forwards 200 OK response to IBCF_A
80						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
81							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
82								→		200 OK	IMS_B forwards 200 OK response to AS_B
83								←		200 OK	AS_B forwards the 200 OK for INVITE
84				←						200 OK	IMS_B forwards 200 OK to UE_B
85			←								User B is informed that call is resumed
86				→				→		ACK	UE_B sends ACK to IMS_B
87								→		ACK	IMS_B forwards ACK to AS_B
88								←		ACK	AS_B forwards ACK to IMS_B
89							←			ACK	IMS_B forwards ACK to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
90						←				ACK	IBCF_B forwards ACK to IBCF_A
91					←					ACK	IBCF_A forwards ACK to IMS_A
92		←								ACK	IMS_A forwards ACK to UE_A
93	←										User A is informed that call resumed
94	→										User A ends call
95		→								BYE	UE_A releases the call with BYE
96					→					BYE	IMS_A forwards BYE to IBCF_A
97						→				BYE	IBCF_A forwards BYE to IBCF_B
98							→			BYE	IBCF_B forwards BYE to IMS_B
99				←						BYE	IMS_B forwards BYE to UE_B
100			←								User B is informed that call has ended
101				→						200 OK	UE_B sends 200 OK for BYE
102							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
103						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
104					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
105		←								200 OK	IMS_A forwards the 200 OK response to UE_A
206	←										User A is informed that call has ended

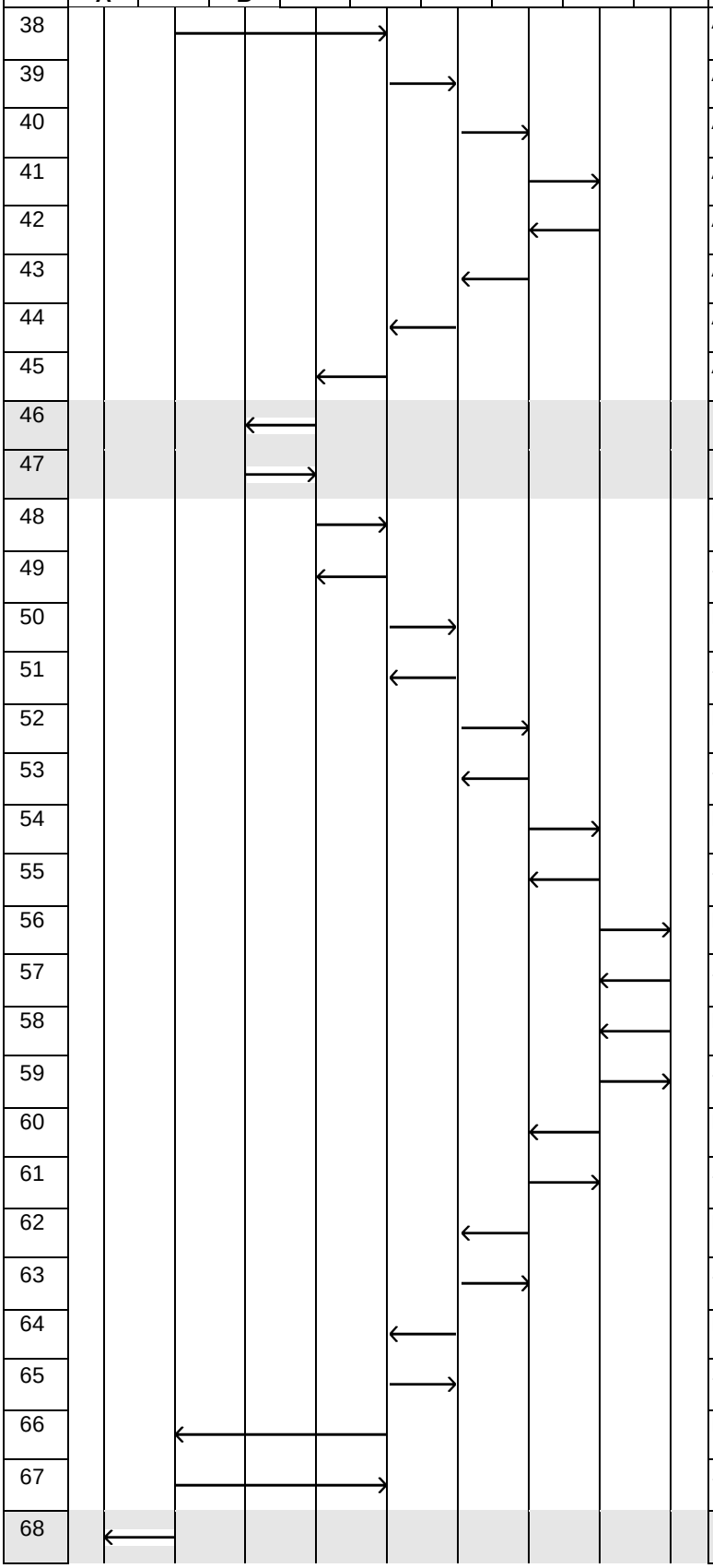
4.4.9.1.2 UC_10_R: SIP Call Flow "call hold and resume with AS tone" using reINVITE with CF_ROAM_AS

The expected call flow sequence is:

Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA			IMSB	ASB		
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 IBCF_A
5					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6						→				INVITE	IBCF_A forwards INVITE to IBCF_B
7						←				100 Trying	IBCF_B responds with a 100 Trying provisional response

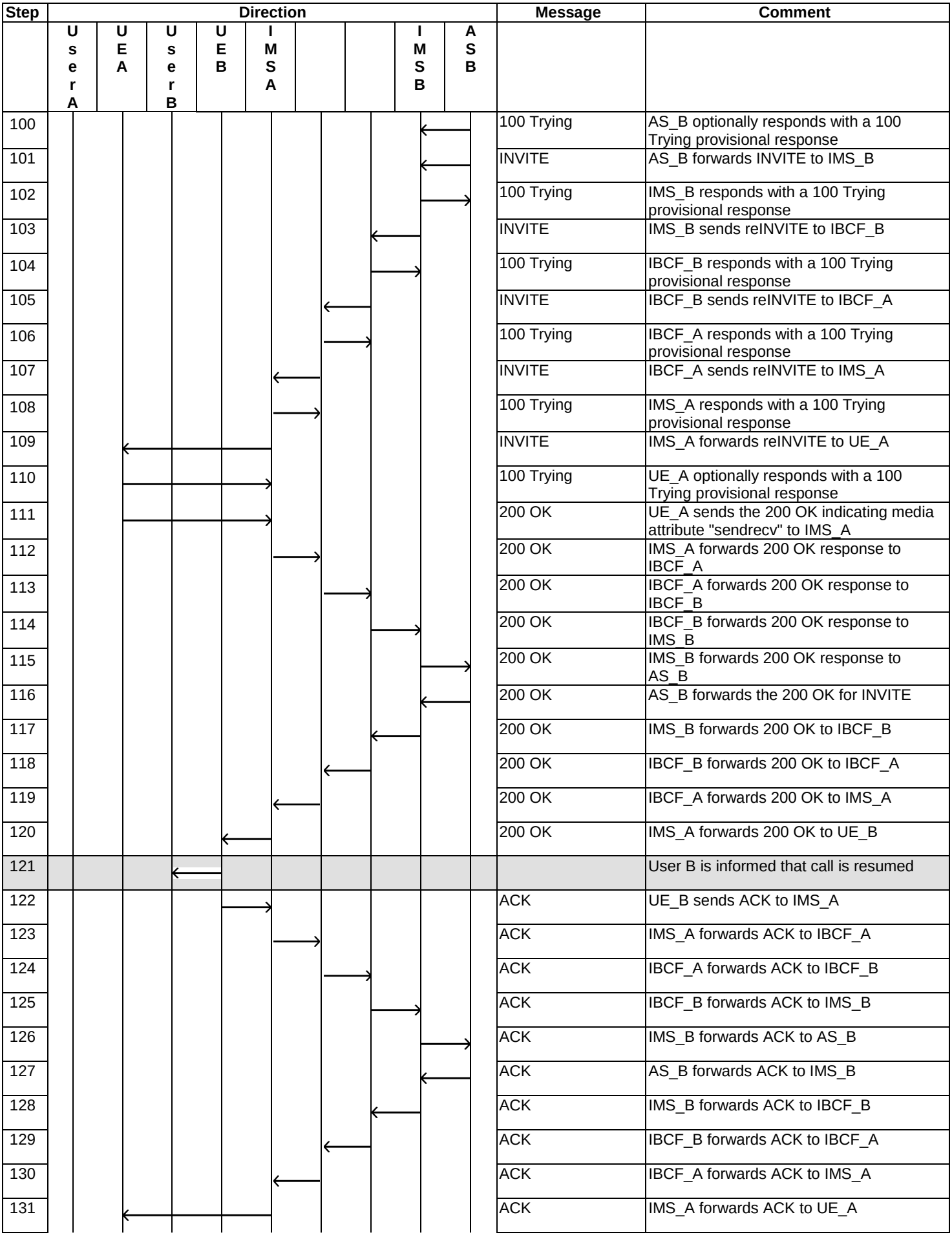


Step	Direction	Message	Comment
8		INVITE	IMS_A forwards INVITE to IMS_B
9		100 Trying	IMS_B responds with a 100 Trying provisional response
10		INVITE	IMS_B forwards INVITE to IBCF_B
11		100 Trying	IBCF_B responds with a 100 Trying provisional response
12		INVITE	IBCF_B forwards INVITE to IBCF_A
13		100 Trying	IBCF_A responds with a 100 Trying provisional response
14		INVITE	IBCF_A forwards INVITE to IMS_A
15		100 Trying	IMS_A responds with a 100 Trying provisional response
16		INVITE	IMS_A forwards INVITE to UE_B
17		100 Trying	UE_B optionally responds with a 100 Trying provisional response
18			User B is informed of incoming call of User A
19		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20		180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
21		180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22		180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23		180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
24		180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25		180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
26		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
27			User A is informed that UE_B is ringing
28			User B answers call
29		200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
30		200 OK	IMS_A forwards 200 OK response to IBCF_A
31		200 OK	IBCF_A forwards 200 OK response to IBCF_B
32		200 OK	IBCF_B forwards 200 OK response to IMS_B
33		200 OK	IMS_B forwards 200 OK response to IBCF_B
34		200 OK	IBCF_B forwards 200 OK response to IBCF_A
35		200 OK	IBCF_A forwards 200 OK response to IMS_A
36		200 OK	IMS_A forwards the 200 OK response to UE_A
37			User A is informed that call has been answered



Step	Message	Comment
38	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
39	ACK	IMS_A forwards ACK to IBCF_A
40	ACK	IBCF_A forwards ACK to IBCF_B
41	ACK	IBCF_B forwards ACK to IMS_B
42	ACK	IMS_B forwards ACK to IBCF_B
43	ACK	IBCF_B forwards ACK to IBCF_A
44	ACK	IBCF_A forwards ACK to IMS_A
45	ACK	IMS_A forwards ACK to UE_B
46		User B is informed that call is established
47		User B puts call on hold
48	INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
49	100 Trying	IMS_A responds with a 100 Trying provisional response
50	INVITE	IMS_A forwards INVITE to IBCF_A
51	100 Trying	IBCF_A responds with a 100 Trying provisional response
52	INVITE	IBCF_A forwards INVITE to IBCF_B
53	100 Trying	IBCF_B responds with a 100 Trying provisional response
54	INVITE	IBCF_B forwards INVITE to IMS_B
55	100 Trying	IMS_B responds with a 100 Trying provisional response
56	INVITE	IMS_B sends reINVITE to AS_B
57	100 Trying	AS_B optionally responds with a 100 Trying provisional response
58	INVITE	AS_B sends reINVITE to IMS_B
59	100 Trying	IMS_B responds with a 100 Trying provisional response
60	INVITE	IMS_B forwards reINVITE to IBCF_B
61	100 Trying	IMS_A responds with a 100 Trying provisional response
62	INVITE	IBCF_B forwards INVITE to IBCF_A
63	100 Trying	IBCF_A responds with a 100 Trying provisional response
64	INVITE	IBCF_A forwards INVITE to IMS_A
65	100 Trying	IMS_A responds with a 100 Trying provisional response
66	INVITE	IMS_A forwards reINVITE to UE_A
67	100 Trying	UE_A optionally responds with a 100 Trying provisional response
68		User A is informed that call is on hold with AS tone

Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / IMS B / AS B		
69		200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
70		200 OK	IMS_A forwards 200 OK response to IBCF_A
71		200 OK	IBCF_A forwards 200 OK response to IBCF_B
72		200 OK	IBCF_B forwards 200 OK response to IMS_B
73		200 OK	IMS_B forwards 200 OK response to AS_B
74		200 OK	AS_B forwards 200 OK response to IMS_B
75		200 OK	IMS_B forwards 200 OK response to IBCF_B
76		200 OK	IBCF_B forwards 200 OK response to IBCF_A
77		200 OK	IBCF_A forwards 200 OK response to IMS_A
78		200 OK	IMS_A forward the 200 OK to UE_B
79			User B is informed that the call is on hold
80		ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
81		ACK	IMS_A forwards ACK to IBCF_A
82		ACK	IBCF_A forwards ACK to IBCF_B
83		ACK	IBCF_B forwards ACK to IMS_B
84		ACK	IMS_B forwards ACK to AS_B
85		ACK	AS_B forwards ACK to IMS_B
86		ACK	IMS_B forwards ACK to IBCF_B
87		ACK	IBCF_B forwards ACK to IBCF_A
88		ACK	IBCF_A forwards ACK to IMS_A
89		ACK	IMS_A forwards ACK to UE_A
90			User B resumes call
91		INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
92		100 Trying	IMS_A responds with a 100 Trying provisional response
93		INVITE	IMS_A sends reINVITE to IBCF_A
94		100 Trying	IBCF_A responds with a 100 Trying provisional response
95		INVITE	IBCF_A sends reINVITE to IBCF_B
96		100 Trying	IBCF_B responds with a 100 Trying provisional response
97		INVITE	IBCF_B sends reINVITE to IMS_B
98		100 Trying	IMS_B responds with a 100 Trying provisional response
99		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		
100		100 Trying	AS_B optionally responds with a 100 Trying provisional response
101		INVITE	AS_B forwards INVITE to IMS_B
102		100 Trying	IMS_B responds with a 100 Trying provisional response
103		INVITE	IMS_B sends reINVITE to IBCF_B
104		100 Trying	IBCF_B responds with a 100 Trying provisional response
105		INVITE	IBCF_B sends reINVITE to IBCF_A
106		100 Trying	IBCF_A responds with a 100 Trying provisional response
107		INVITE	IBCF_A sends reINVITE to IMS_A
108		100 Trying	IMS_A responds with a 100 Trying provisional response
109		INVITE	IMS_A forwards reINVITE to UE_A
110		100 Trying	UE_A optionally responds with a 100 Trying provisional response
111		200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
112		200 OK	IMS_A forwards 200 OK response to IBCF_A
113		200 OK	IBCF_A forwards 200 OK response to IBCF_B
114		200 OK	IBCF_B forwards 200 OK response to IMS_B
115		200 OK	IMS_B forwards 200 OK response to AS_B
116		200 OK	AS_B forwards the 200 OK for INVITE
117		200 OK	IMS_B forwards 200 OK to IBCF_B
118		200 OK	IBCF_B forwards 200 OK to IBCF_A
119		200 OK	IBCF_A forwards 200 OK to IMS_A
120		200 OK	IMS_A forwards 200 OK to UE_B
121			User B is informed that call is resumed
122		ACK	UE_B sends ACK to IMS_A
123		ACK	IMS_A forwards ACK to IBCF_A
124		ACK	IBCF_A forwards ACK to IBCF_B
125		ACK	IBCF_B forwards ACK to IMS_B
126		ACK	IMS_B forwards ACK to AS_B
127		ACK	AS_B forwards ACK to IMS_B
128		ACK	IMS_B forwards ACK to IBCF_B
129		ACK	IBCF_B forwards ACK to IBCF_A
130		ACK	IBCF_A forwards ACK to IMS_A
131		ACK	IMS_A forwards ACK to UE_A

Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A			IMS B	AS B		
132	←										User A is informed that call resumed
133	→										User A ends call
134		→		→						BYE	UE_A releases the call with BYE
135					→					BYE	IMS_A forwards BYE to IBCF_A
136						→				BYE	IBCF_A forwards BYE to IBCF_B
137							→			BYE	IBCF_B forwards BYE to IMS_B
138							←			BYE	IMS_B forwards BYE to IBCF_B
139						←				BYE	IBCF_B forwards BYE to IBCF_A
140					←					BYE	IBCF_A forwards BYE to IMS_A
141				←						BYE	IMS_A forwards BYE to UE_B
142			←								User B is informed that call has ended
143				→						200 OK	UE_B sends 200 OK for BYE
144					→					200 OK	IMS_A forwards 200 OK response to IBCF_A
145						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
146							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
147							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
148						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
149					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
150		←		←						200 OK	IMS_A forwards the 200 OK response to UE_A
151	←										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.

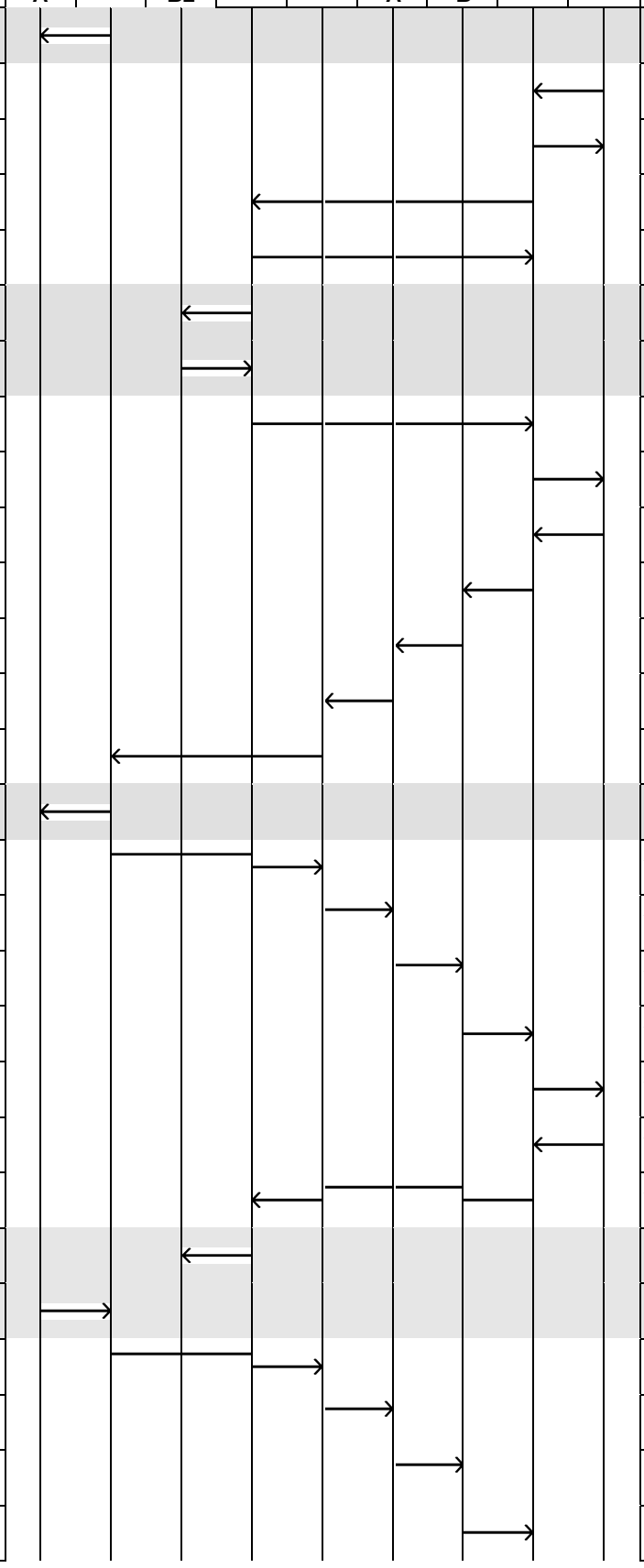
The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

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	17	11
3	User B2 is informed of incoming call of User A	22	18
4	User B2 answers call	23	19
5	User A is informed that call has been answered	31	26
6	User B2 is informed that call is established	39	32
7	User A ends call	40	33
8	User B2 is informed that call has ended	46	37
9	User A is informed that call has ended	52	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 / IBCF A / IBCF B / 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
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		INVITE	**IMS_A forwards INVITE to IBCF_A**
5		100 Trying	**IBCF_A responds with a 100 Trying provisional response**
6		INVITE	**IBCF_A forwards INVITE to IBCF_B**
7		100 Trying	**IBCF_B responds with a 100 Trying provisional response**
8		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the CFU IFC in IMS_B
10		**INVITE**	**IMS_B forwards the INVITE to AS_B**
11		100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
			AS_B applies the CDIV CFU procedure
12		181 Call is being	AS_B indicates optionally to IMS_B that call has been forwarded
13		181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
14		181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
15		181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
16		181 Call is being	IMS_A indicates that call to UE_B has been forwarded



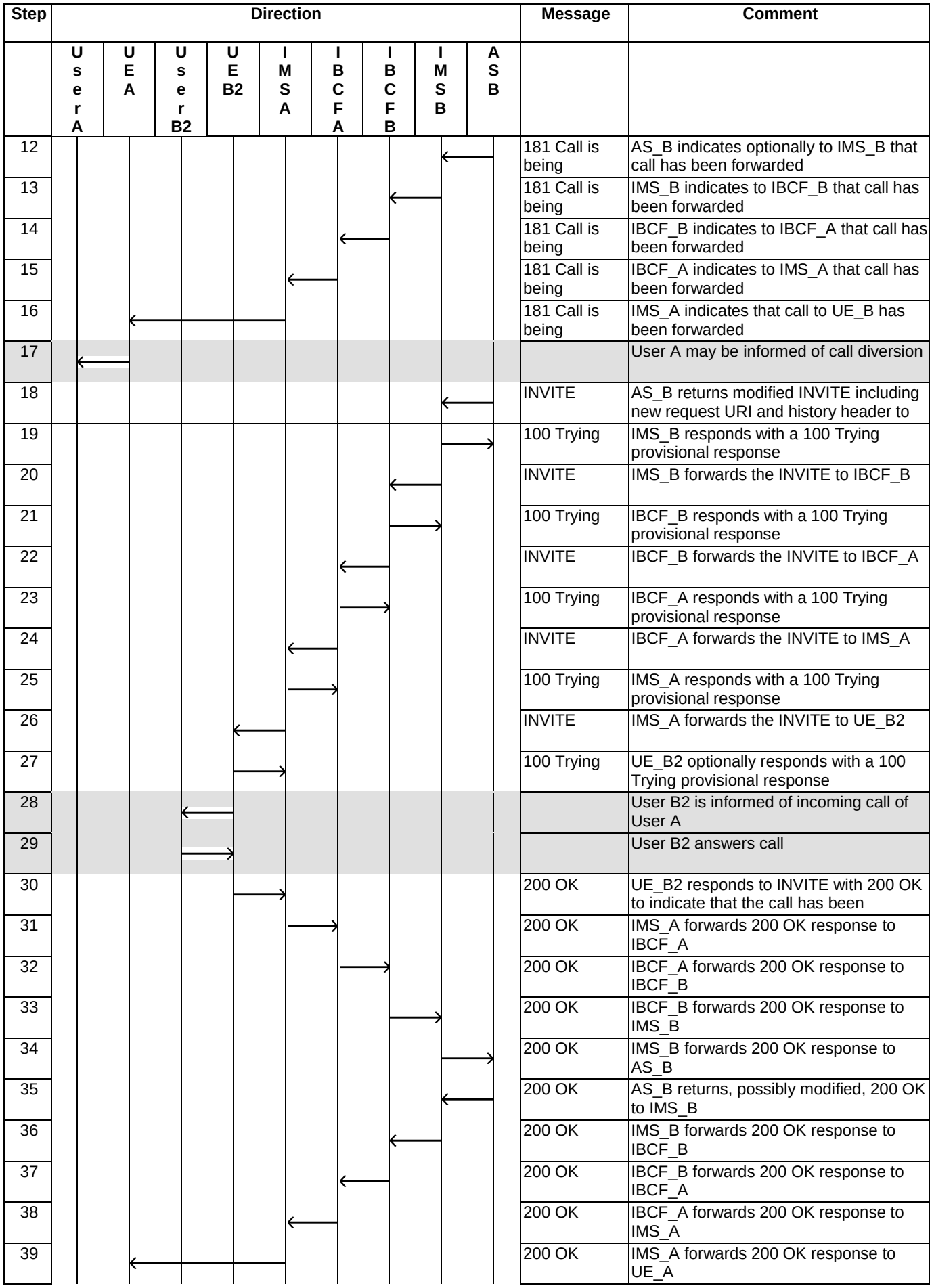
Step	Message	Comment
17		User A may be informed of call diversion
18	INVITE	AS_B returns modified INVITE including new request URI and history header to
19	100 Trying	IMS_B responds with a 100 Trying provisional response
20	INVITE	IMS_B forwards the INVITE to UE_B2
21	100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
22		User B2 is informed of incoming call of User A
23		User B2 answers call
24	200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been
25	200 OK	IMS_B forwards 200 OK response to AS_B
26	200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
27	200 OK	IMS_B forwards 200 OK response to IBCF_B
28	200 OK	IBCF_B forwards 200 OK response to IBCF_A
29	200 OK	IBCF_A forwards 200 OK response to IMS_A
30	200 OK	IMS_A forwards 200 OK response to UE_A
31		User A is informed that call has been answered
32	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
33	ACK	IMS_A forwards ACK to IBCF_A
34	ACK	IBCF_A forwards ACK to IBCF_B
35	ACK	IBCF_B forwards ACK to IMS_B
36	ACK	IMS_B forwards ACK to AS_B
37	ACK	AS_B returns, possibly modified, ACK to IMS_B
38	ACK	IMS_B forwards ACK to UE_B2
39		User B2 is informed that call is established
40		User A ends call
41	BYE	UE_A releases the call with BYE
42	BYE	IMS_A forwards BYE to IBCF_A
43	BYE	IBCF_A forwards BYE to IBCF_B
44	BYE	IBCF_B forwards BYE to IMS_B

Step	Direction									Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IBCF A	IBCF B	IMS B	AS B		
45				←						BYE	IMS_B forwards BYE to UE_B
46			←								
47							→			200 OK	UE_B sends 200 OK for BYE
48							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
49						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
50					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
51		←								200 OK	IMS_A forwards 200 OK response to UE_A
52	←										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	IBCF A	IBCF B	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
3		←			←					100 Trying	IMS_A responds with a 100 Trying provisional response
4					→					INVITE	IMS_A forwards INVITE to IBCF_A
5					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6						→				INVITE	IBCF_A forwards INVITE to IBCF_B
7						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8							→			INVITE	IBCF_B forwards INVITE to IMS_B
9							←			100 Trying	IMS_B responds with a 100 Trying provisional response
											INVITE triggers the CFU IFC in IMS_B
10								→		INVITE	IMS_B forwards the INVITE to AS_B
11								←		100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
											AS_B applies the CDIV CFU procedure



Step	Direction	Message	Comment
	User A / UE A / User B2 / UE B2 / IMS A / IBCF A / IBCF B / IMS B / AS B		
12	←	181 Call is being	AS_B indicates optionally to IMS_B that call has been forwarded
13	←	181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
14	←	181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
15	←	181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
16	←	181 Call is being	IMS_A indicates that call to UE_B has been forwarded
17	←		User A may be informed of call diversion
18	←	INVITE	AS_B returns modified INVITE including new request URI and history header to
19	→	100 Trying	IMS_B responds with a 100 Trying provisional response
20	←	INVITE	IMS_B forwards the INVITE to IBCF_B
21	→	100 Trying	IBCF_B responds with a 100 Trying provisional response
22	←	INVITE	IBCF_B forwards the INVITE to IBCF_A
23	→	100 Trying	IBCF_A responds with a 100 Trying provisional response
24	←	INVITE	IBCF_A forwards the INVITE to IMS_A
25	→	100 Trying	IMS_A responds with a 100 Trying provisional response
26	←	INVITE	IMS_A forwards the INVITE to UE_B2
27	→	100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
28	←		User B2 is informed of incoming call of User A
29	→		User B2 answers call
30	→	200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been
31	→	200 OK	IMS_A forwards 200 OK response to IBCF_A
32	→	200 OK	IBCF_A forwards 200 OK response to IBCF_B
33	→	200 OK	IBCF_B forwards 200 OK response to IMS_B
34	→	200 OK	IMS_B forwards 200 OK response to AS_B
35	←	200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
36	←	200 OK	IMS_B forwards 200 OK response to IBCF_B
37	←	200 OK	IBCF_B forwards 200 OK response to IBCF_A
38	←	200 OK	IBCF_A forwards 200 OK response to IMS_A
39	←	200 OK	IMS_A forwards 200 OK response to UE_A

Step	Direction									Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IBCF A	IBCF B	IMS B	ASB		
40		←									User A is informed that call has been answered
41			→	→	→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
42					→	→				ACK	IMS_A forwards ACK to IBCF_A
43						→	→			ACK	IBCF_A forwards ACK to IBCF_B
44							→	→		ACK	IBCF_B forwards ACK to IMS_B
45								→	→	ACK	IMS_B forwards ACK to AS_B
46								←	←	ACK	AS_B returns, possibly modified, ACK to IMS_B
47							←	←		ACK	IMS_B forwards ACK to IBCF_B
48						←	←			ACK	IBCF_B forwards ACK to IBCF_A
49					←	←				ACK	IBCF_A forwards ACK to IMS_A
50				←	←					ACK	IMS_A forwards ACK to UE_B2
51			←	←							User B2 is informed that call is established
52	→	→									User A ends call
53		→	→	→						BYE	UE_A releases the call with BYE
54					→	→				BYE	IMS_A forwards BYE to IBCF_A
55						→	→			BYE	IBCF_A forwards BYE to IBCF_B
56							→	→		BYE	IBCF_B forwards BYE to IMS_B
57							←	←		BYE	IMS_B forwards BYE to IBCF_B
58						←	←			BYE	IBCF_B forwards BYE to IBCF_A
59					←	←				BYE	IBCF_A forwards BYE to IMS_A
60				←	←					BYE	IMS_A forwards BYE to UE_B
61			←	←							
62				→	→					200 OK	UE_B sends 200 OK for BYE
63					→	→				200 OK	IMS_A forwards 200 OK response to IBCF_A
64						→	→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
65							→	→		200 OK	IBCF_B forwards 200 OK response to IMS_B
66							←	←		200 OK	IMS_B forwards 200 OK response to IBCF_B
67						←	←			200 OK	IBCF_B forwards 200 OK response to IBCF_A

Step	Direction									Message	Comment
	User A	UE A	User B2	UE B2	IMS A	IBCF A	IBCF B	IMS B	AS B		
68					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
69		←								200 OK	IMS_A forwards 200 OK response to UE_A
70	←										User A is informed that call has ended

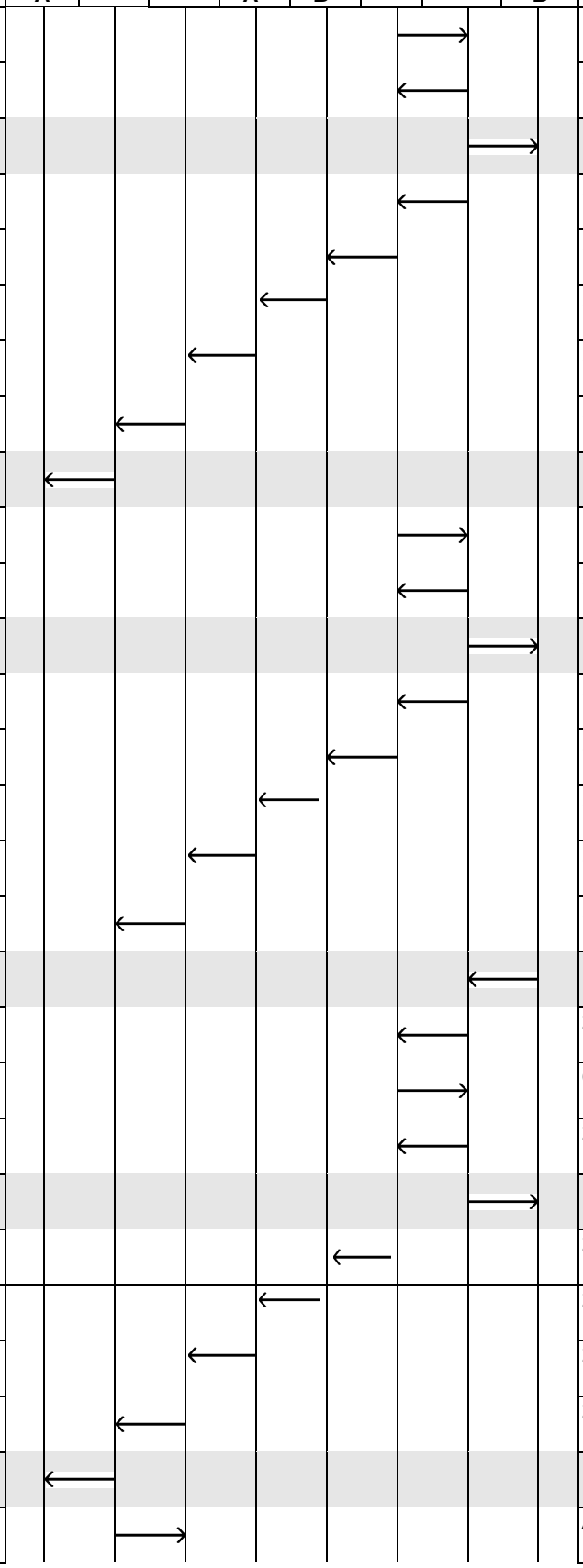
4.4.10.1.3 UC_12: SIP Call Flow "Normal Call" with 2 UEs registered to same public identity

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:

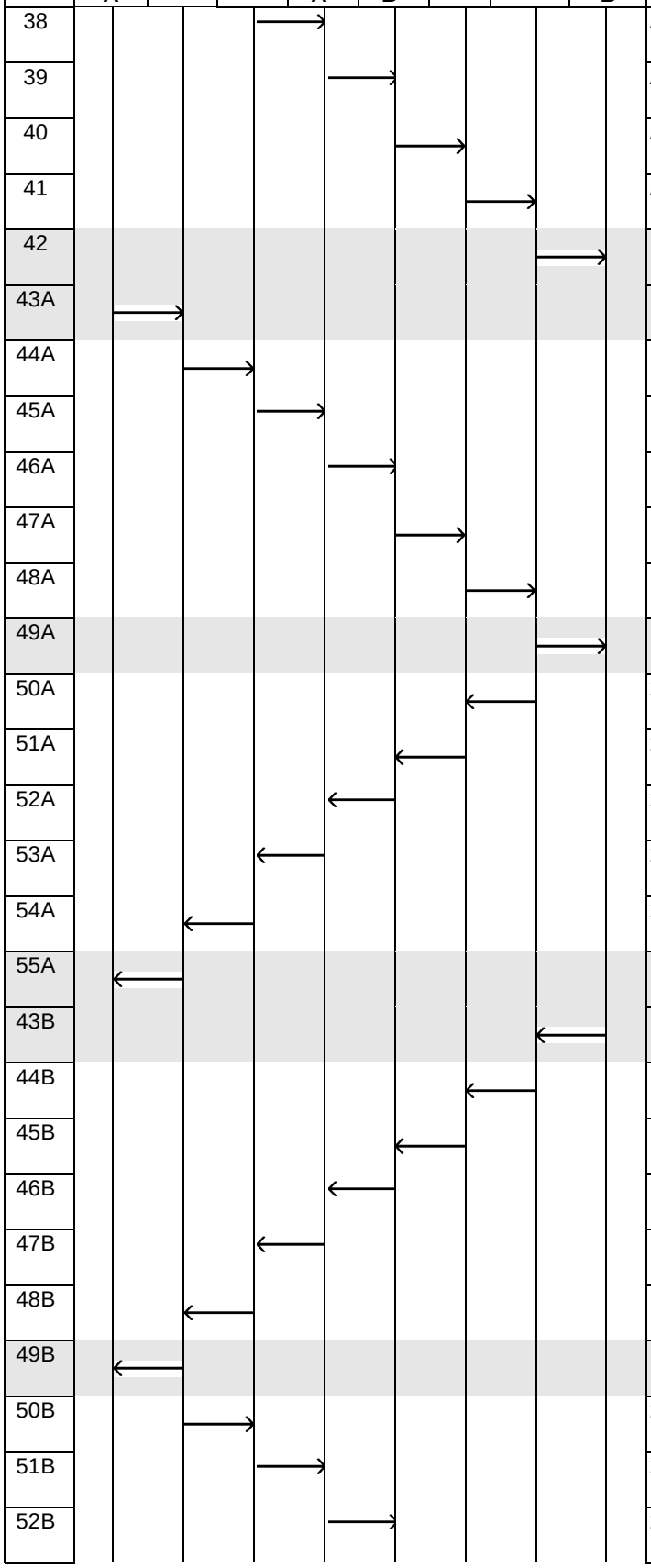
Step	Action	CF_INT_CALL
1	User A calls User B	Step 1
2	User B is informed of incoming call of User A on UE_B1	Step 12
3	User B is informed of incoming call of User A on UE_B2	Step 21
4	User A is informed that a UE of User B is ringing	Step 18
5	User B answers call on UE_B2	Step 27
6	User B is informed at UE_B1 that the call is no longer offered	Step 31
7	User A is informed that call has been answered	Step 36
8	User B is informed that the call is established	Step 42
9A	User A ends call	Step 43A
9B	User B ends call	Step 43B
10A	User B is informed that call has ended	Step 49A
10B	User A is informed that call has ended	Step 49B
11A	User A is informed that call has ended	Step 55A
11B	User B is informed that call has ended	Step 55B

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

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	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
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						INVITE	IMS_A forwards INVITE to IBCF_A
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response



Step	Direction	Message	Comment
	User A / UE A / IMS A / IBCF A / IBCF B / IMS B / UE B / User B		
10	→	INVITE	IMS_B forwards INVITE to UE_B1
11	←	100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
12	→		User B is informed on UE_B1 of incoming call of User A
13	←	180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
14	←	180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
15	←	180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
16	←	180 Ringing	IBCF_A 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 a UE of User B is ringing
19	→	INVITE	IMS_B forwards INVITE to UE_B2
20	←	100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
21	→		User B is informed on UE_B2 of incoming call of User A
22	←	180 Ringing	UE_B2 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
23	←	180 Ringing	IMS_B forwards 2nd 180 Ringing response to IBCF_B
24	←	180 Ringing	IBCF_B forwards the 2nd 180 Ringing response to IBCF_A
25	←	180 Ringing	IBCF_A forwards the 2nd 180 Ringing response to IMS_A
26	←	180 Ringing	IMS_A forwards the 2nd 180 Ringing response to UE_A
27	←		User B answers call at UE_B2
28	←	200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
29	→	CANCEL	IMS_B sends CANCEL request to UE_B1
30	←	200 OK	UE_B1 sends 200 OK response to the CANCEL request to IMS_B
31	→		UE_B1 informs user B that the call is no longer offered to this UE and stops ringing
32	←	200 OK	IMS_B forwards 200 OK response to IBCF_B
33	←	200 OK	IBCF_B forwards 200 OK response to IBCF_A
34	←	200 OK	IBCF_A forwards 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 call has been answered
37	→	ACK	UE_A acknowledges the receipt of 200 OK for INVITE



Step	Direction	Message	Comment
	User A / UEA / IMSA / IBCFA / IBCFB / IMSB / UEB / User B		
38	IMSA → IBCFA	ACK	IMS_A forwards ACK to IBCF_A
39	IBCFA → IBCFB	ACK	IBCF_A forwards ACK to IBCF_B
40	IBCFB → IMSB	ACK	IBCF_B forwards ACK to IMS_B
41	IMSB → UEB	ACK	IMS_B forwards ACK to UE_B
42	UEB → User B		User B is informed that the call is established
43A	User A → UEA		User A ends call
44A	UEA → IMSA	BYE	UE_A releases the call with BYE
45A	IMSA → IBCFA	BYE	IMS_A forwards BYE to IBCF_A
46A	IBCFA → IBCFB	BYE	IBCF_A forwards BYE to IBCF_B
47A	IBCFB → IMSB	BYE	IBCF_B forwards BYE to IMS_B
48A	IMSB → UEB	BYE	IMS_B forwards BYE to UE_B
49A	UEB → User B		User B is informed that call has ended
50A	UEB → IMSB	200 OK	UE_B sends 200 OK for BYE
51A	IMSB → IBCFB	200 OK	IMS_B forwards 200 OK response to IBCF_B
52A	IBCFB → IBCFA	200 OK	IBCF_B forwards 200 OK response to IBCF_A
53A	IBCFA → IMSA	200 OK	IBCF_A forwards 200 OK response to IMS_A
54A	IMSA → UEA	200 OK	IMS_A forwards the 200 OK response to UE_A
55A	UEA → User A		User A is informed that call has ended
43B	User B → UEB		User B ends call
44B	UEB → IMSB	BYE	UE_B releases the call with BYE
45B	IMSB → IBCFB	BYE	IMS_B forwards BYE to IBCF_B
46B	IBCFB → IBCFA	BYE	IBCF_B forwards BYE to IBCF_A
47B	IBCFA → IMSA	BYE	IBCF_A forwards BYE to IMS_A
48B	IMSA → UEA	BYE	IMS_A forwards BYE to UE_A
49B	UEA → User A		User A is informed that call has ended
50B	UEA → IMSA	200 OK	UE_A sends 200 OK for BYE
51B	IMSA → IBCFA	200 OK	IMS_A forwards 200 OK response to IBCF_A
52B	IBCFA → IBCFB	200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
53B						→			200 OK	IBCF_B forwards 200 OK response to IMS_B
54B							→		200 OK	IMS_B forwards the 200 OK response to UE_B
55B								→		User B is informed that call has ended

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.

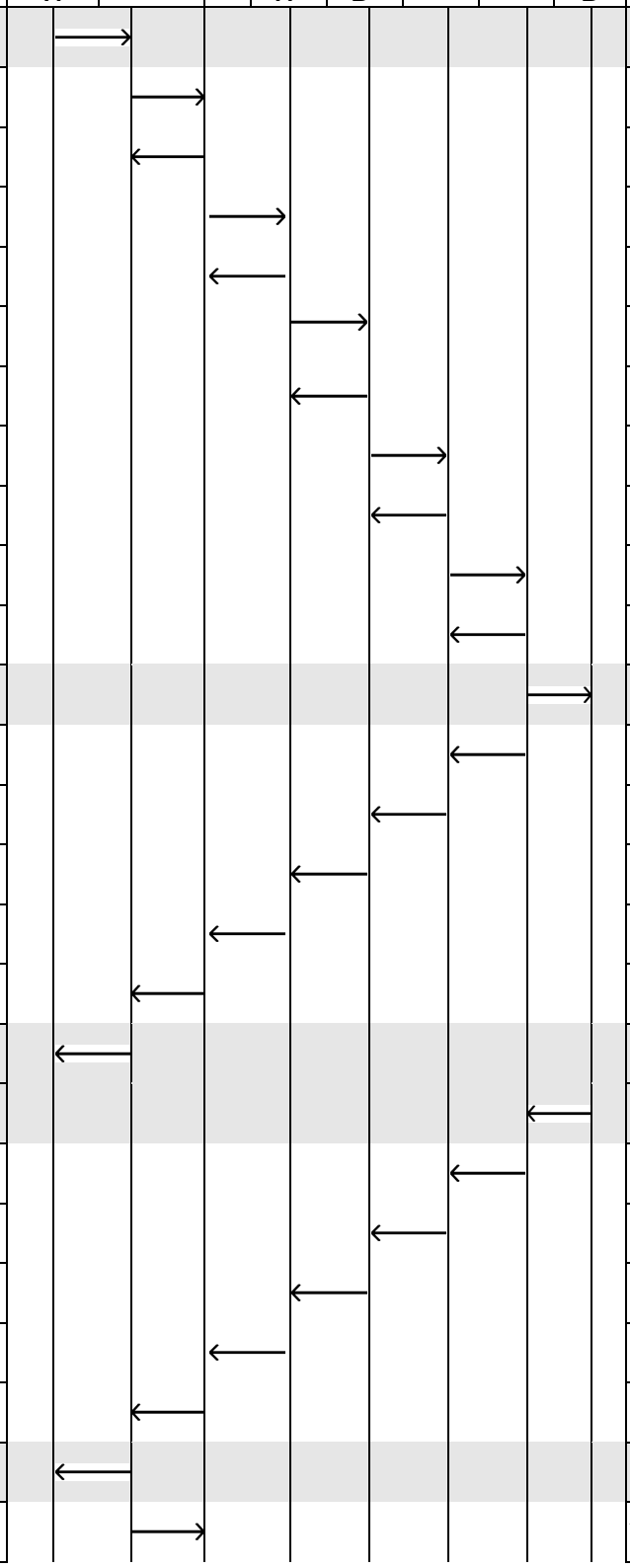
The test sequence and expected call flow sequence for addition of multimedia stream can be illustrated when adding a new media stream, for example, adding a chat/text session during an existing IMS VoIP call:

Step	Action	CF_INT_CALL
1	User A calls User B	1
2	User B is informed of incoming call of User A	12
3	User A is informed that UE_B is ringing	18
4	User B answers call	19
5	User A is informed that call has been answered	25
6	User B is presented that call is established	31
7A	User A adds a new media stream	32A
7B	User B adds a new media stream	32B
8A	User B may be informed to accept/reject new media stream	43A
8B	User A may be informed to accept/reject new media stream	43B
9A	User A may be informed that UE_B is alerting User B	49A
9B	User B may be informed that UE_A is alerting User A	49B
10A	If informed, User B accepts the new media stream	50A
10B	If informed, User A accepts the new media stream	50B
11A	User A is informed that new media stream has been accepted	56A
11B	User B is informed that new media stream has been accepted	56B
12	User A ends call	62
13	User B is informed that call has ended	68
14	User A is informed that call has ended	74

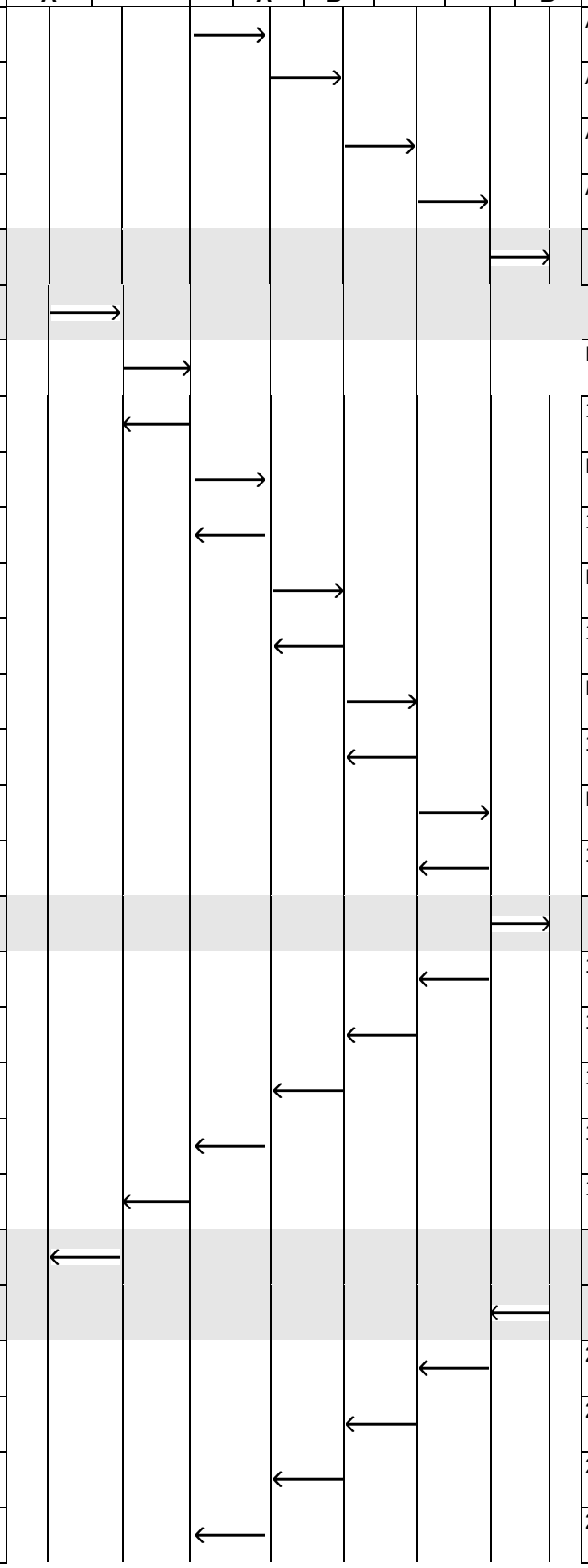
NOTE: Please note that the call flow sequences described in this clause are not limited to multimedia stream handling scenarios where remote user interaction is required. In other words these call flow sequences may be observed for a call scenario where remote user interaction is not invoked. For example, 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 clause 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
1	User A → UE A		User A calls User B
2	UE A → IMS A → IBCF A → IBCF B → IMS B → UE B	INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A
3	UE B → IMS B → IBCF B → IBCF A → IMS A → UE A	100 Trying	IMS_A responds with a 100 Trying provisional response
4	IMS A → IBCF A → IBCF B → IMS B → UE B	INVITE	IMS_A forwards INVITE to IBCF_A
5	IMS A ← IBCF A ← IBCF B ← IMS B ← UE B	100 Trying	IBCF_A responds with a 100 Trying provisional response
6	IBCF A → IBCF B → IMS B → UE B	INVITE	IBCF_A forwards INVITE to IBCF_B
7	IBCF A ← IBCF B ← IMS B ← UE B	100 Trying	IBCF_B responds with a 100 Trying provisional response
8	IBCF B → IMS B → UE B	INVITE	IBCF_B forwards INVITE to IMS_B
9	IBCF B ← IMS B ← UE B	100 Trying	IMS_B responds with a 100 Trying provisional response
10	IMS B → UE B	INVITE	IMS_B forwards INVITE to UE_B
11	IMS B ← UE 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
13	IMS B ← UE B	180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
14	IBCF B ← IMS B ← UE B	180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
15	IBCF A ← IBCF B ← IMS B ← UE B	180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16	IMS A ← IBCF A ← IBCF B ← IMS B ← UE B	180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
17	UE A ← IMS A ← IBCF A ← IBCF B ← IMS B ← UE B	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
18	User A ← UE A		User A is informed that UE_B is ringing
19	UE B ← User B		User B answers call
20	IMS B ← UE B	200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
21	IBCF B ← IMS B ← UE B	200 OK	IMS_B forwards 200 OK response to IBCF_B
22	IBCF A ← IBCF B ← IMS B ← UE B	200 OK	IBCF_B forwards 200 OK response to IBCF_A
23	IMS A ← IBCF A ← IBCF B ← IMS B ← UE B	200 OK	IBCF_A forwards 200 OK response to IMS_A
24	UE A ← IMS A ← IBCF A ← IBCF B ← IMS B ← UE B	200 OK	IMS_A forwards 200 OK response to UE_A
25	User A ← UE A		User A is informed that call has been answered
26	UE A → IMS A → IBCF A → IBCF B → IMS B → UE B	ACK	UE_A acknowledges the receipt of 200 OK for INVITE



Step	Direction	Message	Comment
	User A / UE A / IMS A / IBCF A / IBCF B / IMS B / UE B / User B		
27	IMS_A → IBCF_A	ACK	IMS_A forwards ACK to IBCF_A
28	IBCF_A → IBCF_B	ACK	IBCF_A forwards ACK to IBCF_B
29	IBCF_B → IMS_B	ACK	IBCF_B forwards ACK to IMS_B
30	IMS_B → UE_B	ACK	IMS_B forwards ACK to UE_B
31			User B is informed that the call is established
32A	User A → UE A		User A adds a new media stream
33A	UE_A → IMS_A	INVITE	UE_A sends reINVITE message with new media stream in SDP
34A	IMS_A → UE_A	100 Trying	IMS_A responds with a 100 Trying provisional response
35A	IMS_A → IBCF_A	INVITE	IMS_A forwards INVITE to IBCF_A
36A	IBCF_A → IMS_A	100 Trying	IBCF_A responds with a 100 Trying provisional response
37A	IBCF_A → IBCF_B	INVITE	IBCF_A forwards INVITE to IBCF_B
38A	IBCF_B → IBCF_A	100 Trying	IBCF_A responds with a 100 Trying provisional response
39A	IBCF_B → IMS_B	INVITE	IBCF_B forwards INVITE to IMS_B
40A	IMS_B → IBCF_B	100 Trying	IMS_B responds with a 100 Trying provisional response
41A	IMS_B → UE_B	INVITE	IMS_B forwards INVITE to UE_B
42A	UE_B → IMS_B	100 Trying	UE_B optionally responds with a 100 Trying provisional response
43A			Verify that User B is informed to accept/reject new media stream (optional)
44A	UE_B → IMS_B	180 Ringing	UE_B responds to reINVITE with 180 Ringing
45A	IMS_B → IBCF_B	180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
46A	IBCF_B → IBCF_A	180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
47A	IBCF_A → IMS_A	180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
48A	IMS_A → UE_A	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
49A	UE A → User A		Verify that User A is informed that UE_B is alerting User B (optional)
50A			If informed, User B accepts the new media stream
51A	UE_B → IMS_B	200 OK	UE_B responds with 200 OK to reINVITE
52A	IMS_B → IBCF_B	200 OK	IMS_B forwards 200 OK response to IBCF_B
53A	IBCF_B → IBCF_A	200 OK	IBCF_B forwards 200 OK response to IBCF_A
54A	IBCF_A → IMS_A	200 OK	IBCF_A forwards 200 OK response to IMS_A

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
55A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
56A	←									User A is informed that new media stream has been accepted
57A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
58A			→						ACK	IMS_A forwards ACK to IBCF_A
59A				→					ACK	IBCF_A forwards ACK to IBCF_B
60A					→				ACK	IBCF_B forwards ACK to IMS_B
61A						→			ACK	IMS_B forwards ACK to UE_B
32B							←			User B adds a new media stream
33B						←			INVITE	UE_B sends reINVITE message with new media stream in SDP
34B						→			100 Trying	IMS_B responds with a 100 Trying provisional response
35B					←				INVITE	IMS_B forwards INVITE to IBCF_B
36B					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
37B				←					INVITE	IBCF_B forwards INVITE to IBCF_A
38B				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
39B			←						INVITE	IBCF_A 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	←									Verify that User A is informed to accept/reject new media stream (optional)
44B		→							180 Ringing	UE_A responds to reINVITE with 180 Ringing
45B			→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
46B				→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
47B					→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
48B						→			180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
49B							→			Verify that User B is informed that UE_A is alerting User A (optional)
50B	→									If informed, User A accepts the new media stream
51B		→							200 OK	UE_A responds with 200 OK to reINVITE
52B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
53B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
54B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
55B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
56B							→			User B is informed that new media stream has been accepted
57B						←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
58B					←				ACK	IMS_B forwards ACK to IBCF_B
59B				←					ACK	IBCF_B forwards ACK to IBCF_A
60B			←						ACK	IBCF_A forwards ACK to IMS_A
61B		←							ACK	IMS_A forwards ACK to UE_A
62	→								BYE	User A releases the call
63		→							BYE	UE_A sends BYE to indicate that the call has ended
64			→						BYE	IMS_A forwards the BYE to IBCF_A
65				→					BYE	IBCF_A forwards the BYE to IBCF_B
66					→				BYE	IBCF_B forwards the BYE to IMS_B
67						→			BYE	IMS_B forwards the BYE to UE_B
68							→			User B is informed that call has ended
69						←			200 OK	UE_B responds to the BYE with 200 OK
70					←				200 OK	IMS_B forwards the 200 OK response to IBCF_B
71				←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
72			←						200 OK	IBCF_A forwards the 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

4.4.12 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	62A	62A
2B	User B removes one of the media streams	62B	62B
3A	User B is informed that the media stream has been removed	68A	73A
3B	User A is informed that the media stream has been removed	68B	73B
4	User A releases the call	74	84
5	User B is informed that call has ended	80	90
6	User A is informed that call has ended	86	96

NOTE: Please note that the call flow sequences described in this clause 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 / IBCF A / IBCF B / IMS B / UE B / User B		
1			User A initiates a multimedia session with at least two streams with User B
62A			User A removes one of the media streams
63A		UPDATE	UE_A sends UPDATE to IMS_A
64A		UPDATE	IMS_A forwards the UPDATE to IBCF_A
65A		UPDATE	IBCF_A forwards the UPDATE to IBCF_B
66A		UPDATE	IBCF_B forwards the UPDATE to IMS_B
67A		UPDATE	IMS_B forwards the UPDATE to UE_B
68A			User B is informed that the media stream has been removed
69A		200 OK	UE_B responds with 200 OK to UPDATE
70A		200 OK	IMS_B forwards 200 OK response to IBCF_B
71A		200 OK	IBCF_B forwards 200 OK response to IBCF_A
72A		200 OK	IBCF_A forwards 200 OK response to IMS_A
73A		200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
62B							←			User B removes one of the media streams
63B						←			UPDATE	UE_B sends UPDATE to IMS_B
64B					←				UPDATE	IMS_B forwards the UPDATE to IBCF_B
65B				←					UPDATE	IBCF_B forwards the UPDATE to IBCF_A
66B			←						UPDATE	IBCF_A forwards the UPDATE to IMS_A
67B		←							UPDATE	IMS_A forwards the UPDATE to UE_A
68B	←									User A is informed that the media stream has been removed
69B		→							200 OK	UE_A responds with 200 OK to UPDATE
70B			→						200 OK	IMS_A forwards the 200 OK response to IBCF_A
71B				→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
72B					→				200 OK	IBCF_B forwards the 200 OK response to IMS_B
73B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
74	→									User A releases the call
75		→							BYE	UE_A sends BYE to IMS_A
76			→						BYE	IMS_A sends BYE to IBCF_A
77				→					BYE	IBCF_A sends BYE to IBCF_B
78					→				BYE	IBCF_B forwards the BYE to IMS_B
79						→			BYE	IMS_B forwards the BYE to UE_B
80							→			User B is informed that call has ended
81						←			200 OK	UE_B sends 200 OK response for BYE
82					←				200 OK	IMS_B forwards the 200 OK response to IBCF_B
83				←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
84			←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
85		←							200 OK	IMS_A forwards the 200 OK response to UE_A
86	←									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 / IBCF A / IBCF B / IMS B / UE B / User B		
1			User A initiates a multimedia session with at least two streams with User B
62A			User A removes one of the media streams
63A		INVITE	UE_A sends reINVITE to IMS_A
64A		100 Trying	IMS_A responds with a 100 Trying provisional response
65A		INVITE	IMS_A forwards the reINVITE to IBCF_A
66A		100 Trying	IBCF_A responds with a 100 Trying provisional response
67A		INVITE	IBCF_A forwards the reINVITE to IBCF_B
68A		100 Trying	IBCF_B responds with a 100 Trying provisional response
69A		INVITE	IBCF_B forwards the reINVITE to IMS_B
70A		100 Trying	IMS_B responds with a 100 Trying provisional response
71A		INVITE	IMS_B forwards the reINVITE to UE_B
72A		100 Trying	UE_B optionally responds with a 100 Trying provisional response
73A			User B is informed that the media stream has been removed
74A		200 OK	UE_B responds with 200 OK to reINVITE
75A		200 OK	IMS_B forwards the 200 OK response to IBCF_B
76A		200 OK	IBCF_B forwards the 200 OK response to IBCF_A
77A		200 OK	IBCF_A forwards the 200 OK response to IMS_A
78A		200 OK	IMS_A forwards the 200 OK response to UE_A
79A		ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
80A		ACK	IMS_A forwards the ACK to IBCF_A
81A		ACK	IBCF_A forwards the ACK to IBCF_B
82A		ACK	IBCF_B forwards the ACK to IMS_B
83A		ACK	IMS_B forwards the ACK to UE_B
62B			User B removes one of the media streams
63B		INVITE	UE_B sends reINVITE to IMS_B
64B		100 Trying	IMS_B responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
65B					←				INVITE	IMS_B forwards the reINVITE to IBCF_B
66B					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
67B				←					INVITE	IBCF_B forwards the reINVITE to IBCF_A
68B				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
69B			←						INVITE	IBCF_A forwards the reINVITE to IMS_A
70B			→						100 Trying	IMS_A responds with a 100 Trying provisional response
71B		←							INVITE	IMS_A forwards the reINVITE to UE_A
72B		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
73B	←									User A is informed that the media stream has been removed
74B		→							200 OK	UE_A responds with 200 OK to reINVITE
75B			→						200 OK	IMS_A forwards the 200 OK response to IBCF_A
76B				→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
77B					→				200 OK	IBCF_B forwards the 200 OK response to IMS_B
78B						→			200 OK	IMS_B forwards the 200 OK response to UE_B
79B						←			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
80B					←				ACK	IMS_B forwards ACK to IBCF_B
81B				←					ACK	IBCF_B forwards ACK to IBCF_A
82B			←						ACK	IIBCF_A forwards ACK to IMS_A
83B		←							ACK	IMS_A forwards ACK to UE_A
84	→									User A releases the call
85		→							BYE	UE_A sends BYE to IMS_A
86			→						BYE	IMS_A forwards BYE to IBCF_A
87				→					BYE	IBCF_A forwards BYE to IBCF_B
88					→				BYE	IBCF_B forwards BYE to IMS_B
89						→			BYE	IMS_B forwards BYE to UE_B
90							→			User B is informed that call has ended
91						←			200 OK	UE_B sends 200 OK for BYE
92					←				200 OK	IMS_B forwards the 200 OK response to IBCF_B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
93				←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
94				←					200 OK	IBCF_A forwards the 200 OK response to IMS_A
95			←						200 OK	IMS_A forwards the 200 OK response to UE_A
96		←								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 functionalities 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 31
6	User A is notified that User B is being invited to join the call	Step 39
7	User B joins the conference	Step 47
8	User A is notified that User B has joined the conference	Step 55
9	User B leaves the conference	Step 58
10	User B is informed that the conference has ended	Step 69
11	User A is notified that user B has left the conference	Step 72

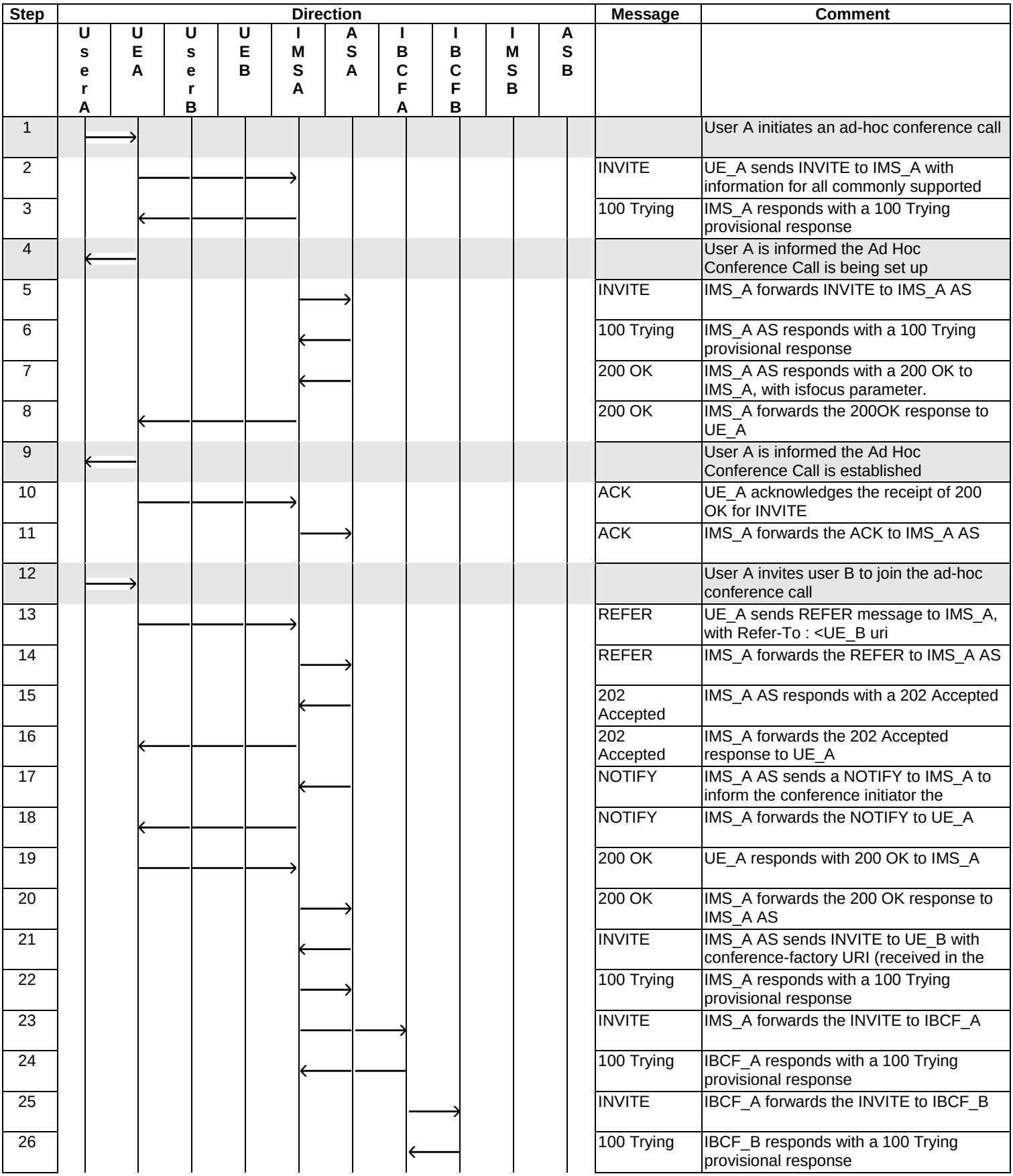
NOTE 1: The proposed test configuration shown in CF_INT_CONF_CALL indicates CONF AS A (AS+MRFC+MRFP) resources in IMS A, hence the UC refers to UE_A as conference initiator in IMS A, and UE_B, although the same UC applies alternatively for UE_B as conference initiator in IMS B and UE_A as participant 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.

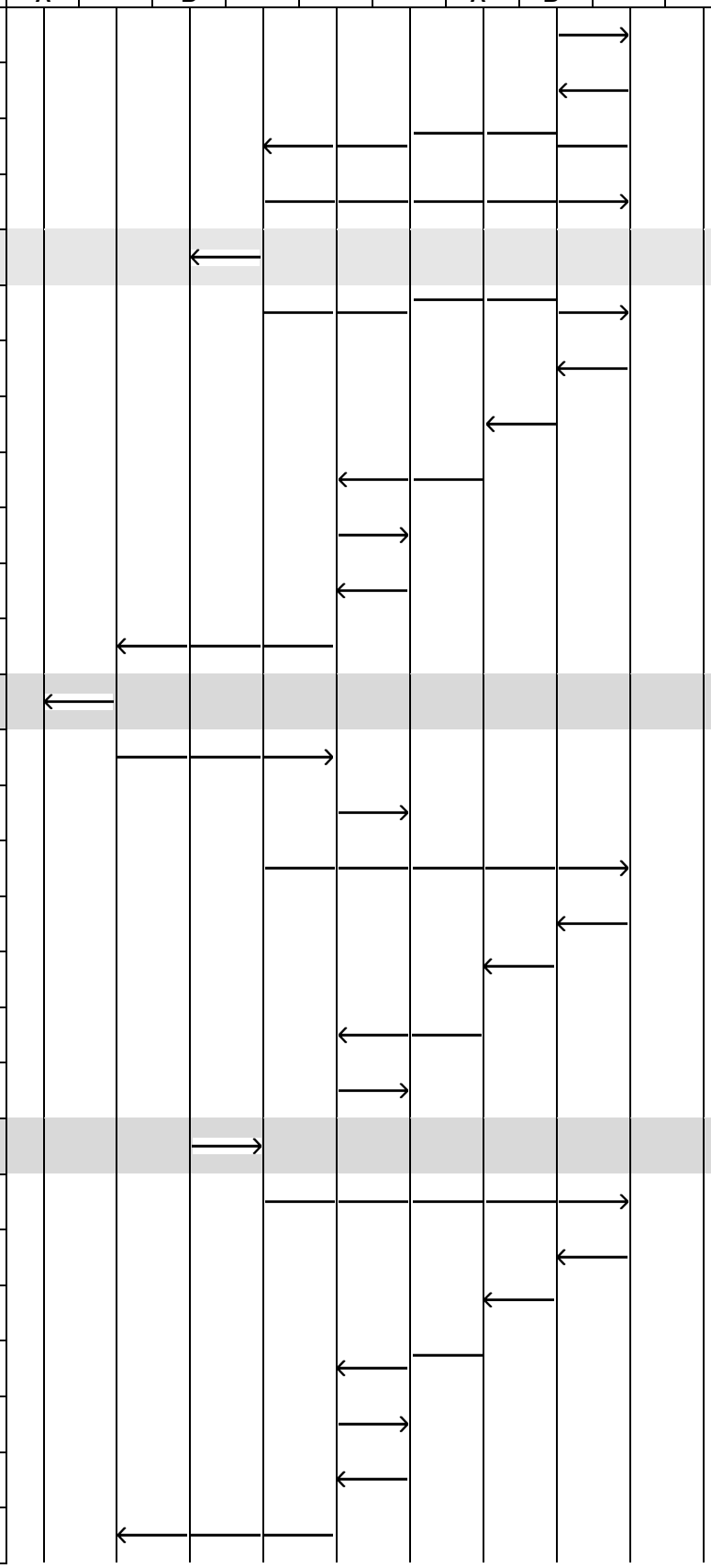
This proposal is consistent with the most common interoperability scenario where one vendor provides the complete solution for the conference service, integrated into a 3rd party IMS core via ISC interface.

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

The expected call flow sequence is:



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



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
27								→			INVITE	IBCF_B forwards the INVITE to IMS_B
28								←			100 Trying	IMS_B responds with a 100 Trying provisional response
29				←							INVITE	IMS_B forwards the INVITE to UE_B
30									→		100 Trying	UE_B responds with a 100 Trying provisional response
31			←									User B is informed of incoming invitation from User A to join the Conference Call
32									→		180 Ringing	UE_B sends a 180 ringing to IMS_B
33								←			180 Ringing	IMS_B forwards the 180 ringing to IBCF_B
34							←				180 Ringing	IBCF_B forwards the 180 ringing to IBCF_A
35					←						180 Ringing	IBCF_A forwards the 180 ringing to IMS_A
36						→					180 Ringing	IMS_A forwards the 180 ringing to IMS_A AS
37					←						NOTIFY	Upon reception of 180 Ringing from UE_B, IMS_A AS sends NOTIFY with
38		←									NOTIFY	IMS_A forwards the NOTIFY to UE_A
39	←											User A is notified that User B is being invited to join the call
40		→		→							200 OK	UE_A responds with 200 OK to IMS_A for NOTIFY
41					→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
42									→		**200 OK**	**UE_B responds with 200 OK to IMS_B for INVITE**
43								←			**200 OK**	**IMS B forwards the 200 OK response to IBCF_B**
44							←				200 OK	IBCF_B forwards the 200 OK response to IBCF_A
45					←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
46						→					200 OK	IMS A forwards the 200 OK response to IMS_A AS
47			→									User B joins the conference
48				→					→		ACK	UE_B acknowledges the 200 OK for INVITE
49								←			ACK	IMS B forwards the ACK to IBCF_B
50							←				ACK	IBCF_B forwards the ACK to IBCF_A
51					←						ACK	IBCF_A forwards the ACK to IMS_A
52						→					ACK	IMS A forwards the ACK to IMS_A AS
53					←						NOTIFY	AS_A sends NOTIFY to UE_A to inform it has successfully joined the conference
54		←									NOTIFY	IMS_A forwards NOTIFY to UE_A

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
55	←											User A is alerted that User B has joined the conference
56		→	→	→							200 OK	UE_A sends 200 OK response for NOTIFY
57					→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
58			→									User B leaves the conference
59				→	→	→	→	→			BYE	UE_B sends BYE to IMS_B to leave the conference
60								←			BYE	IMS_B forwards the BYE to IBCF_B
61							←				BYE	IBCF_B forwards the BYE to IBCF_A
62					←						BYE	IBCF_A forwards the BYE to IMS_A
63					→						BYE	IMS_A forwards the BYE to IMS_A AS
64					←						200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK
65					→	→					200 OK	IMS_A forwards the 200 OK response to IBCF_A
66							→				200 OK	IBCF_A forwards the 200 OK response to IBCF_B
67								→			200 OK	IBCF_B forwards the 200 OK response to IMS_B
68				←	→	→	→	→			200 OK	IMS_B forwards the 200 OK response to UE_B
69			←									User B is informed that the conference has ended
70					←						NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the conference
71		←									NOTIFY	IMS_A forwards NOTIFY to UE_A
72	←											User A is notified that user B has left the conference
73		→	→	→							200 OK	UE_A sends a 200 OK response for NOTIFY
74					→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS

4.4.14 Presence service

The use case for the presence service is defined in TS 102 901 [17].

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 test 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 → UE A		User A initiates a CoD session (content selection)
2	UE A → IMS A	INVITE	UE_A sends a INVITE to IMS_A
3	IMS A → AS A	INVITE	IMS_A forwards the INVITE to AS_A (SCF)
4	AS A → IMS A	INVITE	AS_A forwards the INVITE to IMS_A
5	IMS A → AS A	INVITE	IMS_A forwards the INVITE to AS_A (MF)
6	AS A → IMS A	200 OK	AS_A (MF) responds with 200 OK
7	IMS A → AS A	200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8	AS A → IMS A	200 OK	AS_A forwards the 200 OK response to IMS_A
9	IMS A → UE A	200 OK	IMS_A forwards the 200 OK response to UE_A
10	UE A → IMS A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11	IMS A → AS A	ACK	IMS_A forwards the ACK to AS_A (SCF)
12	AS A → IMS A	ACK	AS_A forwards the ACK to IMS_A
13	IMS A → AS A	ACK	IMS_A forwards the ACK to AS_A (MF)
			UE_A sets up RTSP with AS_A (MF)
14	UE A → IMS A	INVITE	UE_A sends reINVITE message indicating media attribute " a=recvonly "
15	IMS A → AS A	INVITE	IMS_A forwards the reINVITE to AS_A (SCF)
16	AS A → IMS A	INVITE	AS_A forwards the reINVITE to IMS_A
17	IMS A → AS A	INVITE	IMS_A forwards the reINVITE to AS_A (MF)
18	AS A → IMS A	200 OK	AS_A (MF) responds with 200 OK
19	IMS A → AS A	200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
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

4.4.15.2.3 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 clause. 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

4.4.16 IMS-PSTN Interoperability

4.4.16.1 IMS-to-PSTN call

4.4.16.1.1 Description

UE_A places an IMS VoIP call to a user that is located in a PSTN environment (UE_B). Once the media path is established, the originating user or the destination user releases the call. The call flow path and node configuration for this use case corresponds to CF_PSTN.

4.4.16.1.2 UC_20: IMS-to-PSTN call

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

Step	Action	CFW
1	User A calls User B	Step 1
2	User B is informed of incoming call of User A	Step 13
3	User A is informed that UE_B is ringing	Step 17
4	User B answers call	Step 18
5	User A is informed that call has been answered	Step 22
6	User A and B can communicate	Step 25
7	User A ends call	Step 26A
8	User B is informed that call has ended	Step 30A
9	User A is informed that call has ended	Step 34A
10	User B ends call	Step 26B
11	User B is informed that call has ended	Step 29B
12	User A is informed that call has ended	Step 32B

The expected call flow sequence is:

Step	Direction	Message	Comment
	User A / UE A / IMS A / MGCF / PSTN / User B		
1	→ UE A		User A calls User B
2	UE A → IMS A	INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that
3	IMS A → UE A	100 Trying	IMS_A responds with a 100 Trying provisional response
4	IMS A → MGCF	INVITE	IMS_A forwards INVITE to MGCF
5	MGCF → IMS A	100 Trying	MGCF responds with a 100 Trying provisional response
6	MGCF → IMS A	183 Session Progress	MGCF responds with 183 Session Progress response
7	IMS A → UE A	183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
8	UE A → IMS A	PRACK	UE_A sends PRACK to IMS_A
9	IMS A → MGCF	PRACK	IMS_A forwards PRACK to MGCF
10	MGCF → IMS A	200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
11	IMS A → UE A	200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
12	MGCF → PSTN	IAM	MGCF sends IAM to PSTN
13	PSTN → User B		User B is informed of incoming call of User A
14	PSTN → MGCF	ACM/CPG	PSTN responds with ACM/CPG
15	MGCF → IMS A	180 Ringing	MGCF sends 180 Ringing response to IMS_A
16	IMS A → UE A	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
17	UE A → User A		User A is informed that UE_B is ringing
18	User B → PSTN		User B answers call

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
19				←			ANM	PSTN sends ANM to MGCF
20			←				200 OK	MGCF sends 200 OK response to IMS_A
21		←					200 OK	IMS_A forwards 200 OK response to UE_A
22	←							User A is informed that call has been answered
23		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
24			→				ACK	IMS_A forwards ACK to MGCF
25								User A and B can communicate
26A	→							User A ends call
27A		→					BYE	UE_A sends BYE
28A			→				BYE	IMS_A forwards BYE to MGCF
29A				→			REL	MGCF sends REL to PSTN
30A					→			User B is informed that call has ended
31A				←			RLC	PSTN sends RLC response to MGCF
32A			←				200 OK	MGCF sends 200 OK response to IMS_A
33A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
34A	←							User A is informed that call has ended
26B					←			User B ends call
27B				←			REL	PSTN sends BYE to MGCF
28B				→			RLC	MGCF responds RLC to PSTN
29B					→			User B is informed that call has ended
30B			←				BYE	MGCF sends 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 MGCF

4.4.16.2 PSTN-to-IMS call

4.4.16.2.1 Description

UE_B that is located in a PSTN environment places a call towards UE_A that is located in the IMS. Once the media path is established, the originating user or the destination user releases the call. The call flow path and node configuration for this use case corresponds to CF_PSTN.

4.4.16.2.2 UC_21: PSTN-to-IMS call

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

Step	Action	CFW
1	User B calls User A	Step 1
2	User A is informed of incoming call of User B	Step 17
3	User B is informed that UE_A is ringing	Step 21
4	User A answers call	Step 22
5	User A is informed that call has been answered	Step 16
6	User A and B can communicate	Step 28
7	User A ends call	Step 29A
8	User B is informed that call has ended	Step 34A
9	User A is informed that call has ended	Step 37A
10	User B ends call	Step 29B
11	User B is informed that call has ended	Step 32B
12	User A is informed that call has ended	Step 35B

The expected call flow sequence is:

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
1					←			User B calls User A
2				←			IAM	PSTN send IAM to MGCF
3			←				INVITE	MGCF sends INVITE to IMS_A (SDP with precondition status, MIME subtype "telephone-event" §6.4.1)
4			→				100 Trying	IMS_A responds with a 100 Trying provisional response
5		←					INVITE	IMS_A forwards INVITE to UE_A
6		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
7		→					183 Session Progress	UE_A sends 183 Session Progress response to IMS_A
8			→				183 Session Progress	IMS_A forwards 183 Session Progress response to MGCF
9			←				PRACK	MGCF responds with PRACK to IMS_A
10		←					PRACK	IMS_A forwards PRACK to UE_A
11		→					200 OK (PRACK)	UE_A responds with 200 OK to IMS_A
12			→				200 OK (PRACK)	IMS_A forwards 200 OK to MGCF
13			←				UPDATE	MGCF sends UPDATE to IMS_A

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
14		←					UPDATE	IMS_A forwards UPDATE to UE_A
15		→					200 OK (UPDATE)	UE_A responds with 200 OK to IMS_A
16			→				200 OK (UPDATE)	IMS_A forwards 200 OK to MGCF
17	←							User A is informed of incoming call of User B
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 180 Ringing response to MGCF
20				→			ACM/CPG	MGCF send ACM/CPG to PSTN
21					→			User B is informed that UE_A is ringing
22	→							User A answers the call
23		→					200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
24			→				200 OK	IMS_A forwards 200 OK response to MGCF
25				→			ANM	MGCF sends ANM to PSTN
26			←				ACK	MGCF sends ACK to PSTN
27		←					ACK	IMS_A forwards ACK to UE_A
28	←							User A and B can communicate
29A	→							User A ends call
30A		→					BYE	UE_A releases the call with BYE
31A			→				BYE	IMS_A forwards BYE to MGCF
32A				→			REL	MGCF sends REL to PSTN
33A				←			RLC	PSTN sends response RLC to MGCF
34A					→			User B is informed that call has ended
35A			←				200 OK	MGCF sends 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
29B					←			User B ends call
30B				←			REL	PSTN sends REL to MGCF
31B				→			RLC	MGCF sends RLC to PSTN

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
32B					←			User B is informed that call has ended
33B				←			BYE	MGCF sends 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 MGCF

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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see tables 6.1 and 6.3)	
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 4 (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	IBCF A	IBCF B	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 IBCF_A**
4				→					**MESSAGE**	**IBCF_A sends MESSAGE to IBCF_B**
5						→			**MESSAGE**	**IBCF_B sends MESSAGE to IMS_B with via header indicating TCP**
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 IBCF_B
10				←					200 OK	IBCF_B sends 200 OK to IBCF_A
11			←						200 OK	IBCF_A sends 200 OK to IMS_A
12		←							200 OK	IMS_A sends 200 OK to UE_A
13	←									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_AKA	
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], clauses 5.2.2.1 ¶16 (2nd numbered list) and 5.2.2.2
	TP_IMS_5011_02	TS 124 229 [1], clauses 5.2.2.1 ¶1 ¶16 (2nd numbered list) and 5.2.2.2
	TP_IMS_5044_01	TS 124 229 [1], clause 5.2.3 ¶2 (1st numbered list)
	TP_IMS_5089_01	TS 124 229 [1], clause 5.4.1.2.1A ¶1
	TP_IMS_5092_01	TS 124 229 [1], clause 5.4.1.2.2F ¶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 4 (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-value_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 12 (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-value_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 19 (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-value_parameter }* *}*
	4	TP_IMS_5089_01 in CFW step 7 (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 15 (200 Ok): *ensure that {* *when { UE_B sends a protected REGISTER to IMS_B and* *IMS_A sends the REGISTER to IMS_B}* *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 22 (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" }* *}*

Interoperability Test Description		
Identifier:	TD_IMS_REG_0001_MD5	
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_03	TS 124 229 [1], clauses 5.2.2.1 ¶16 (2nd numbered list) and 5.2.2.3
	TP_IMS_5011_04	TS 124 229 [1], clauses 5.2.2.1 ¶16 (2nd numbered list) and 5.2.2.3
	TP_IMS_5044_01	TS 124 229 [1], clause 5.2.3 ¶2 (1st numbered list)
	TP_IMS_5089_02	TS 124 229 [1], clause 5.4.1.2.1B ¶1
	TP_IMS_5092_01	TS 124 229 [1], clause 5.4.1.2.2F ¶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 MD5 digest authentication	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any valid user identity
	2	Verify that UE_B shows successful registration

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5011_03 in CFW step 4 (REGISTER): *ensure that {* *when { UE_B sends an unprotected REGISTER to IMS_A }* *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-value_parameter and* *containing an orig-ioi_parameter and* *not containing a term-ioi_parameter) and* *containing a Authorization_header* *(not containing an integrity-protected_parameter or* *containing an integrity-protected_parameter* *indicating ip-assoc-pending) and* *containing a P-Visited-Network-ID_header* *indicating "the visited network at the home network" }* *}*
	2	TP_IMS_5011_04 in CFW step 12 (REGISTER): *ensure that {* *when { UE_B sends a protected REGISTER to IMS_A }* *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-value_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 ip-assoc-yes and* *containing a P-Visited-Network-ID_header* *indicating "the visited network at the home network" }* *}*
	3	TP_IMS_5044_01 in CFW step 19 (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-value_parameter }* *}*

Interoperability Test Description		
	4	TP_IMS_5089_02 in CFW step 7 (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 }* *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 and* *containing an algorithm_parameter* *indicating MD5 and* *containing qop_parameter* *indicating MD5 }* *}*
	5	TP_IMS_5092_01 in CFW step 15 (200 Ok): *ensure that {* *when { UE_B sends a protected REGISTER to IMS_B and* *IMS_A sends the REGISTER to IMS_B}* *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 22 (200 Ok): *ensure that {* *when {* *IMS_B receives a SUBSCRIBE from UE_B via IMS_A* *containing an Event_header indicating the reg_event_package }* *then {* *IMS_B sends a 2XX_response to UE_B* *containing an Expires_header* *indicating "the same or lower expiry time than* *specified in the initial SUBSCRIBE" }* *}*

Step	Direction						Message	Comment
	User B	**UE B**	**IMS A**	**IBCF A**	**IBCF B**	**IMS B**		
1	→							User B registers in IMS B
2		→					REGISTER	UE_B sends a REGISTER to IMS_A
3			→				REGISTER	IMS_A forwards the REGISTER to IBCF_A
4				→			REGISTER	IBCF_A forwards the REGISTER to IBCF_B
5					→		REGISTER	IBCF_B forwards the REGISTER to IMS_B

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
6					←		401 Unauthorized	IMS_B responds with 401 Unauthorized to IBCF_B
7				←			401 Unauthorized	IBCF_B forwards the 401 Unauthorized to IBCF_A
8			←				401 Unauthorized	IBCF_A forwards the 401 Unauthorized to IMS_A
9		←					401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
10		→					REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
11			→				REGISTER	IMS_A forwards the REGISTER to IBCF A
12				→			REGISTER	IBCF_A forwards the REGISTER to IBCF B
13					→		REGISTER	IBCF_B forwards the REGISTER to IMS B
14					←		200 OK	IMS_B responds with 200 OK
15				←			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
16			←				**200 OK**	**IBCF_A forwards the 200 OK response to IMS_A**
17		←					200 OK	IMS_A forwards the 200 OK response to UE_B
18			→				**SUBSCRIBE**	**IMS_A sends a SUBSCRIBE to IBCF_A**
19				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE to IBCF_B
20					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE to IMS_B
21					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
22				←			200 OK or 202 Accepted	IBCF_B forwards 200 OK or 202 Accepted to IBCF_A
23			←				200 OK or 202 Accepted	IBCF_A forwards 200 OK or 202 Accepted to IMS_A
24					←		NOTIFY	IMS_B sends a NOTIFY to IBCF_B, containing UE_B's registration status
25				←			NOTIFY	IBCF_B forwards NOTIFY to IBCF_A
26			←				NOTIFY	IBCF_A forwards NOTIFY to IMS_A
27			→				200 OK	IMS_A responds to the NOTIFY with a 200 OK
28				→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
39					→		200 OK	IBCF_B forwards 200 OK response to IMS_B
30		→					SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
31			→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IBCF_A
32				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE request to IBCF_B
33					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE request to IMS_B

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
34					←		**200 OK** or 202 Accepted	**IMS_B responds with 200 OK** or 202 Accepted
35				←			200 OK or 202 Accepted	IBCF_B forwards the 200 OK or 202 Accepted response to IBCF_A
36			←				200 OK or 202 Accepted	IBCF_A forwards the 200 OK or 202 Accepted response to IMS_A
37		←					200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
38					←		NOTIFY	IMS_B sends a NOTIFY to IBCF_B, containing UE_B's registration status
39				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
40			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
41		←					NOTIFY	IMS_A forwards the NOTIFY to UE_B
42		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
43			→				200 OK	IMS_A forwards the 200 OK to IBCF_A
44				→			200 OK	IBCF_A forwards the 200 OK to IBCF_B
45					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
46	←							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 5.2.2.1 ¶33 (item 6 in 2nd numbered list)
	TP_IMS_5092_01	TS 124 229 [1], clause 5.4.1.2.2F ¶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 not configured for topology hiding • First entry point determined by the IMS_A pointing to a non-existing component in IMS_B	
Test Sequence:	**Step**	
	1	User B registers in IMS B using any user identity
	2	Verify that UE_B shows successful registration

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5203_01 in CFW step 7 (REGISTER): [I-CSCF] *ensure that {* *when { IMS_A receives no response from IMS_B }* *then { IMS_A sends the REGISTER to another_entry_point of IMS_B }* *}*

	2	TP_IMS_5092_01 in CFW step 18 (200 Ok):
		ensure that {
		when { UE_B sends a protected REGISTER to IMS_B and
		IMS_A sends the REGISTER to IMS_B}
		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	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	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 IBCF_A
4				→			REGISTER	IBCF_A forwards the REGISTER to IBCF_B
5					→		REGISTER	IBCF_B forwards the REGISTER to the first entry point of IMS_B
								No response from IMS_B
6				→			REGISTER	**IMS_A sends a REGISTER to another entry point defined for IMS_B**
7					→		REGISTER	IBCF_A forwards the REGISTER to IBCF_B
8					→		**REGISTER**	IBCF_B forwards the REGISTER to IMS_B
9					←		401 Unauthorized	IMS_B responds with 401 Unauthorized to IBCF_B
10				←			401 Unauthorized	IBCF_B forwards the 401 Unauthorized to IBCF_A
11			←				401 Unauthorized	IBCF_A forwards the 401 Unauthorized to IMS_A
12		←					401 Unauthorized	IMS_A forwards the 401 Unauthorized to UE_B
13		→					REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
14			→				REGISTER	IMS_A forwards the REGISTER to IBCF A
15				→			REGISTER	IBCF_A forwards the REGISTER to IBCF B
16					→		**REGISTER**	IBCF_B forwards the REGISTER to IMS B
17					←		200 OK	IMS_B responds with 200 OK
18				←			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
19			←				200 OK	**IBCF_A forwards the 200 OK response to IMS_A**
20		←					200 OK	IMS_A forwards the 200 OK response to UE_B
21			→				SUBSCRIBE	**IMS_A sends a SUBSCRIBE to IBCF_A**
22				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE to IBCF_B
23					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE to IMS_B
24					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
25				←			200 OK or 202 Accepted	IBCF_B forwards 200 OK or 202 Accepted to IBCF_A
26			←				200 OK or 202 Accepted	IBCF_A forwards 200 OK or 202 Accepted to IMS_A
27					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
28				←			NOTIFY	IBCF_B forwards NOTIFY to IBCF_A
29			←				NOTIFY	IBCF_A forwards NOTIFY to IMS_A
30			→				200 OK	IMS_A responds to the NOTIFY with a 200 OK
31				→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
32					→		200 OK	IBCF_B forwards 200 OK response to IMS_B
33		→					SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
34			→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IBCF_A
35				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE request to IBCF_B
36					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE request to IMS_B
37					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
38				←			200 OK or 202 Accepted	IBCF_B forwards the 200 OK or 202 Accepted response to IBCF_A
39			←				200 OK or 202 Accepted	IBCF_A forwards the 200 OK or 202 Accepted response to IMS_A
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 IBCF_B, containing UE_B's registration status

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
42				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
43			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
44		←					NOTIFY	IMS_A forwards the NOTIFY to UE_B
45		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
46			→				200 OK	IMS_A forwards the 200 OK to IBCF_A
47				→			200 OK	IBCF_A forwards the 200 OK to IBCF_B
48					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
49	←							User B is informed about successful registration

4.5.2.3 403 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 7 (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
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
1	→							User B activates the UE in a visited network
2		→					REGISTER	UE_B sends a REGISTER to IMS_A
3			→				REGISTER	**IMS_A forwards the REGISTER to IBCF_A**
4				→			REGISTER	**IBCF_A forwards the REGISTER to IBCF_B**
5					→		**REGISTER**	**IBCF_B forwards the REGISTER to IMS_B**
6					←		**403 Forbidden**	**IMS_B responds with 403 Forbidden to IBCF_B**
7				←			**403 Forbidden**	IBCF_B forwards the 403 Forbidden to IBCF_A
8			←				**403 Forbidden**	IBCF_A forwards the 403 Forbidden to IMS_A
9		←					403 Forbidden	IMS_A forwards the 403 Forbidden to UE_B
10	←							User B is informed about the registration is rejected

4.5.2.4 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 (1st numbered list)
Use Case ref.:	UC_01_R	
Pre-test conditions:	• HSS of IMS_B is configured according to table 1 • UE_B IP bearers established to IMS_A as per clause 4.2.1 • UE_B registered in IMS_B via IMS_A using any user identity • IMS_A within the trust domain of IMS_B	
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 48 and 56 *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 P-Charging-Vector header* *containing an icid-value_parameter 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*

Interoperability Test Description
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 P-Charging-Vector header* *containing an icid-value_parameter 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	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
								IMS_B is triggered to de-register user B
47					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing UE_B's de-registration**
48				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
49			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
50		←					NOTIFY	IMS_A sends a NOTIFY to UE_B, containing UE_B's de-registration
51		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
52			→				200 OK	IMS_A forwards the 200 OK response to IBCF_A
53				→			200 OK	IBCF_A forwards the 200 OK response to IBCF_B
54					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
55					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing IMS_A's de-registration**
56				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
57			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
58			→				200 OK	IMS_A responds to the NOTIFY with a 200 OK
59				→			200 OK	IBCF_A forwards the 200 OK response to IBCF_B
60					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
61	←							User B is informed about de-registration

4.5.2.5 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
Conformance Criteria:	**Check**	
	1	TP_IMS_5094_01 in CFW steps 48 and 56 *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 P-Charging-Vector header* *containing an icid-value_parameter 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*

Interoperability Test Description		
		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 P-Charging-Vector header* *containing an icid-value_parameter 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	IBCF A	IBCF B	IMS B		
								IMS_B is triggered to re-authenticate user B
47					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing UE_B's re-authentication**
48				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
49			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
50		←					NOTIFY	IMS_B sends a NOTIFY to UE_B, containing UE_ re-authentication
51		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
52			→				200 OK	IMS_A forwards the 200 OK to IBCF_A
53				→			200 OK	IBCF_A forwards the 200 OK response to IBCF_B
54					→		200 OK	IBCF_B forwards the 200 OK response to IMS_B
55					←		**NOTIFY**	**IMS_B sends a NOTIFY to IMS_A, containing IMS_A's re-authentication**
56				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
57			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
58			→				200 OK	IMS_A responds to the NOTIFY with a 200 OK
59				→			200 OK	IBCF_A forwards the 200 OK response to IBCF_B
60					→		200 OK	IBCF_B forwards the 200 OK response to IMS_B
61		→					REGISTER	UE_B sends the same REGISTER containing authentication challenge response to IMS_A
62			→				REGISTER	IMS_A forwards the REGISTER to IBCF A
63				→			REGISTER	IBCF_A forwards the REGISTER to IBCF B
64					→		**REGISTER**	IBCF_B forwards the REGISTER to IMS B
65					←		200 OK	IMS_B responds with 200 OK
66				←			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
67			←				200 OK	**IBCF_A forwards the 200 OK response to IMS_A**
68		←					200 OK	IMS_A forwards the 200 OK response to UE_B
69			→				SUBSCRIBE	**IMS_A sends a SUBSCRIBE to IBCF_A**
70				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE to IBCF_B
71					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE to IMS_B
72					←		200 OK or 202 Accepted	IMS_B responds with a 200 OK or 202 Accepted
73				←			200 OK or 202 Accepted	IBCF_B forwards 200 OK or 202 Accepted to IBCF_A

Step	Direction						Message	Comment
	User B	UE B	IMS A	IBCF A	IBCF B	IMS B		
74			←	←			200 OK or 202 Accepted	IBCF_A forwards 200 OK or 202 Accepted to IMS_A
75					←		NOTIFY	IMS_B sends a NOTIFY to IMS_A, containing UE_B's registration status
76				←			NOTIFY	IBCF_B forwards NOTIFY to IBCF_A
77			←				NOTIFY	IBCF_A forwards NOTIFY to IMS_A
78			→				200 OK	IMS_A responds to the NOTIFY with a 200 OK
79				→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
80					→		200 OK	IBCF_B forwards 200 OK response to IMS_B
81		→					SUBSCRIBE	UE_B sends a SUBSCRIBE (reg event package) to IMS_A
82			→				SUBSCRIBE	IMS_A forwards the SUBSCRIBE request to IBCF_A
83				→			SUBSCRIBE	IBCF_A forwards the SUBSCRIBE request to IBCF_B
84					→		SUBSCRIBE	IBCF_B forwards the SUBSCRIBE request to IMS_B
85					←		200 OK or 202 Accepted	IMS_B responds to the SUBSCRIBE with a 200 OK or 202 Accepted
86				←			200 OK or 202 Accepted	IBCF_B forwards the 200 OK or 202 Accepted response to IBCF_A
87			←				200 OK or 202 Accepted	IBCF_A forwards the 200 OK or 202 Accepted response to IMS_A
88		←					200 OK or 202 Accepted	IMS_A forwards the 200 OK or 202 Accepted response to UE_B
89					←		NOTIFY	IMS_B sends a NOTIFY to IBCF_B, containing UE_B's registration status
90				←			NOTIFY	IBCF_B forwards the NOTIFY to IBCF_A
91			←				NOTIFY	IBCF_A forwards the NOTIFY to IMS_A
92		←					NOTIFY	IMS_A forwards the NOTIFY to UE_B
93		→					200 OK	UE_B responds to the NOTIFY with a 200 OK
94			→				200 OK	IMS_A forwards the 200 OK to IBCF_A
95				→			200 OK	IBCF_A forwards the 200 OK to IBCF_B
96					→		200 OK	IBCF_B forwards the 200 OK to IMS_B
97			←					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

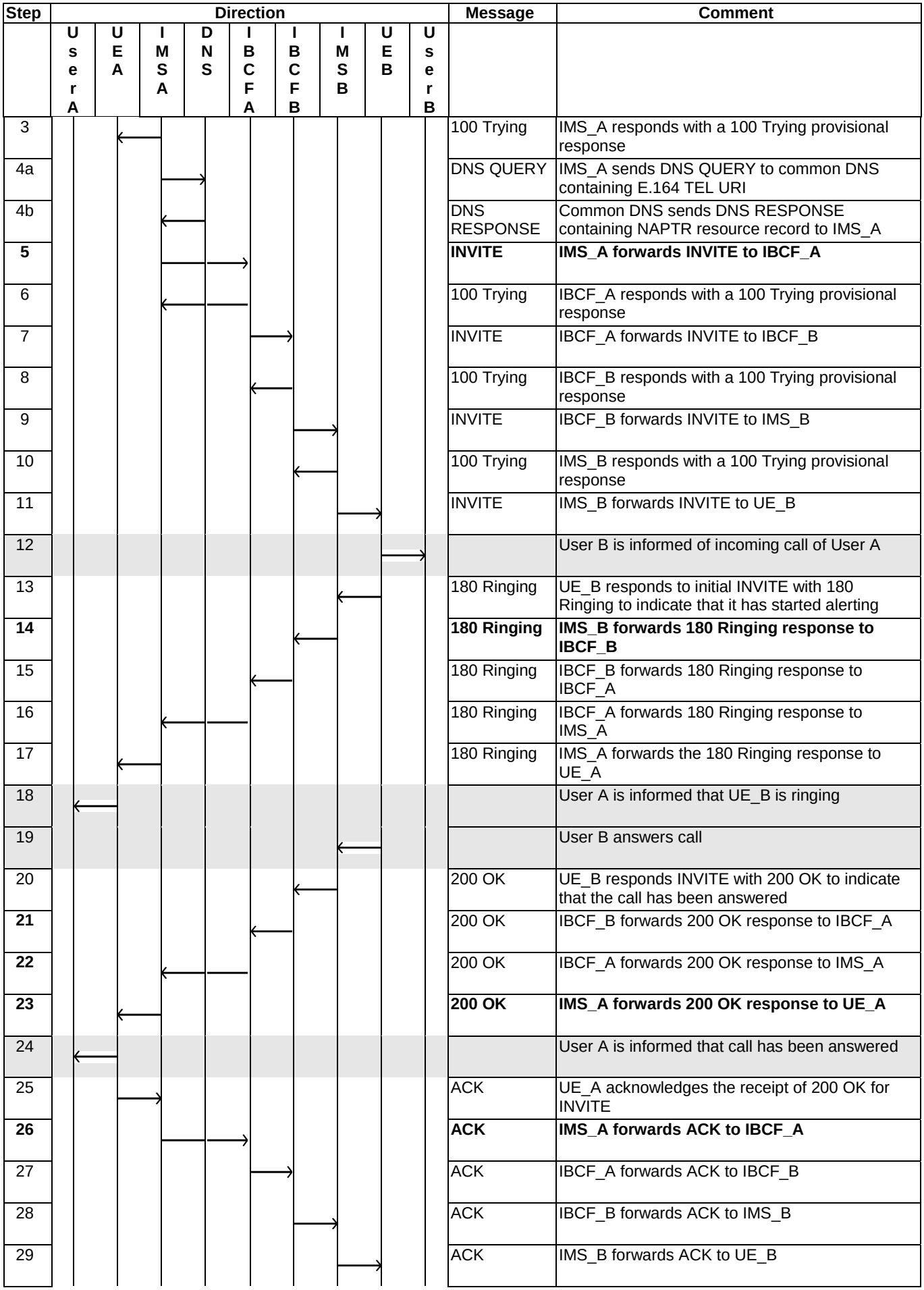
4.5.3.1.1.1 Default SIP URI with DNS/ENUM lookup procedure

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 ¶11 (1st numbered list)
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 9 in 1st numbered list)
	TP_IMS_5097_04	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 10 in 1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 3 in 4th numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 4th numbered list)
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 10)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 10)
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 that user B is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 7 (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-value_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 7 (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 7 (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 27 (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 34A (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 15 (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 15 (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 21 (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 21 (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 15 (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 21 (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	IBCF A	IBCF B	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



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

Step	Direction									Message	Comment
	User A	UEA	IMSA	DNS	IBCFA	IBCFB	IMSB	UEB	User 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 IBCF_A**
34A					→					BYE	IBCF_A forwards BYE to IBCF_B
35A						→				BYE	IBCF_B forwards BYE to IMS_B
36A							→			BYE	IMS_B forwards BYE to UE_B
37A								→			User B is informed that call has ended
38A							←			200 OK	UE_B sends 200 OK for BYE
39A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
40A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
41A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
42A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
43A	←										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 ¶11 (1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 10)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 10)
Use Case ref.:	UC_12	

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 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	Verify that user B is informed of incoming call of User A on UE_B1
	3	Verify that user B is informed of incoming call of User A on UE_B2
	4	Verify that user A is informed that a UE of User B is ringing
	5	User B answers call on UE_B2
	6	Verify that user B is informed at UE_B1 that the call is no longer offered
	7	Verify that user A is informed that call has been answered
	8	Verify that user B is informed that the call is established
	9	User A ends the call
	10	Verify that user B is informed that call has ended
	11	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 6 (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-value_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 35 (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 42A (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 15 and 24 (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* *}*

Interoperability Test Description		
	5	TP_IMS_5115_02 in CFW step 29 (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* *}*
	6	TP_IMS_5131_01 in CFW step 15 and 24 (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 29 (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	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10						→			INVITE	IMS_B forwards INVITE to UE_B1
11						←			100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
12							→			User B is informed on UE_B1 of incoming call of User A
13						←			180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
14					←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IBCF_B**
15				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16			←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
17		←							180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
18	←									User A is informed that UE_B is ringing
19						→			INVITE	IMS_B forwards INVITE to UE_B2
20						←			100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
21							←			User B is informed on UE_B2 of incoming call of User A
22						←			180 Ringing	UE_B2 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
23					←				**180 Ringing**	**IMS_B forwards 2nd 180 Ringing response to IBCF_B**
24				←					180 Ringing	IBCF_B forwards the 2nd 180 Ringing response to IBCF_A
25			←						180 Ringing	IBCF_A forwards the 2nd 180 Ringing response to IMS_A
26		←							180 Ringing	IMS_A forwards the 2nd 180 Ringing response to UE_A
27							←			User B answers call at UE_B2
28						←			200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
29						→			CANCEL	IMS_B sends CANCEL request to UE_B1
20						←			200 OK	UE_B1 sends 200 OK response to the CANCEL request to IMS_B
27							→			UE_B1 informs user B that the call is no longer offered to this UE and stops ringing
28					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
29				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
30			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
31		←							**200 OK**	**IMS_A forwards 200 OK response to UE_A**
32	←									User A is informed that call has been answered
33		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
34			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
35				→					ACK	IBCF_A forwards ACK to IBCF_B
36					→				ACK	IBCF_B forwards ACK to IMS_B
37						→			ACK	IMS_B forwards ACK to UE_B
38							→			User B is informed that the call is established
39A	→									User A ends call
40A		→							BYE	UE_A releases the call with BYE

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
41A			→						**BYE**	**IMS_A forwards BYE to IBCF_A**
42A				→					BYE	IBCF_A forwards BYE to IBCF_B
43A					→				BYE	IBCF_B forwards BYE to IMS_B
44A						→			BYE	IMS_B forwards BYE to UE_B
45A							→			User B is informed that call has ended
46A						←			200 OK	UE_B sends 200 OK for BYE
47A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
48A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
49A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
50A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
51A	←									User B 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 ¶11 (1st numbered list)
	TP_IMS_5097_02	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 9 1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 4th numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 4th numbered list)
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 4th numbered list)
	TP_IMS_5131_01	TS 124 229 [1], clause 5.4.3.3 ¶62 (after note 10)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 10)
Use Case ref.:	UC_02_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 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 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_01 in CFW step 6 (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-value_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 6 (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 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 }* *}*
	4	TP_IMS_5107_01 in CFW step 35A (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		
	5	TP_IMS_5115_01 in CFW step 15 (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 15 (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 22 (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* *}*
	8	TP_IMS_5115_04 in CFW step 22 (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 15 (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 22 (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	**UEA**	**IMSA**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
4			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10						→			INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B**
15				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16			←						180 Ringing	IBCF_A forwards 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 IBCF_B**
22				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
23			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
24		←							**200 OK**	**IMS_A forwards 200 OK response to UE_A**
25	←									User A is informed that call has been answered
26		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
28				→					ACK	IBCF_A forwards ACK to IBCF_B
29					→				ACK	IBCF_B forwards ACK to IMS_B
30						→			ACK	IMS_B forwards ACK to UE_B
31							→			User B is informed that the call is established

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
32A		→								User A ends call
33A			→						BYE	UE_A releases the call with BYE
34A				→					**BYE**	**IMS_A forwards BYE to IBCF_A**
35A					→				BYE	IBCF_A forwards BYE to IBCF_B
36A						→			BYE	IBCF_B forwards BYE to IMS_B
37A							→		BYE	IMS_B forwards BYE to UE_B
38A								→		User B is informed that call has ended
39A						←			200 OK	UE_B sends 200 OK for BYE
40A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
41A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
42A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
43A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
44A	←									User A 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 ¶8 (item 1 in 1st numbered list)
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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_05 in CFW step 11 (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	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				404 Not Found	**IMS_B responds to the INVITE with 404 Not Found**
11				←					404 Not Found	IBCF_B forwards 404 Not Found response to IBCF_A
12			←						404 Not Found	IBCF_A forwards 404 Not Found response to IMS_A
13		←							404 Not Found	**IMS_A forwards** 404 Not Found **response to UE_A**
14	←									User A is informed that call has failed
15		→							ACK	UE_A acknowledges the response
16			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
17				→					ACK	IBCF_A forwards ACK to IBCF_B
18					→				ACK	IBCF_B forwards 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 ¶54 (after 5th numbered list)
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 11 (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	IBCF A	IBCF B	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 IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				404 Not Found	**IMS_B responds to the INVITE with 404 Not Found**
11				←					404 Not Found	IBCF_B forwards 404 Not Found response to IBCF_A
12			←						404 Not Found	IBCF_A forwards 404 Not Found response to IMS_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
13		←							404 Not Found	**IMS_A forwards** 404 Not Found **response to UE_A**
14	←									User A is informed that call has failed
15		→							ACK	UE_A acknowledges the response
16			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
17				→					ACK	IBCF_A forwards ACK to IBCF_B
18					→				ACK	IBCF_B forwards 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 ¶55 (before 6th numbered list)
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 11 (4xx): *ensure that {* *when { UE_A sends INVITE to UE_B }* *then { IMS_B sends a 4xx_response to IMS_A }* *}*

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1	→									User A calls User B
2		→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←							100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				4xx	**IMS_B responds to the INVITE with 4xx**
11				←					4xx	IBCF_B forwards 4xx response to IBCF_A
12			←						4xx	IBCF_A forwards 4xx response to IMS_A
13		←							4xx	**IMS_A forwards** 4xx **response to UE_A**
14	←									User A is informed that call has failed
15		→							ACK	UE_A acknowledges the response
16			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
17				→					ACK	IBCF_A forwards ACK to IBCF_B
18					→				ACK	IBCF_B forwards 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 ¶76 (after 2nd numbered list)
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 11 (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	IBCF A	IBCF B	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
3			←						100 Trying	IMS_A responds with a 100 Trying provisional response
4				→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6					→				INVITE	IBCF_A forwards INVITE to IBCF_B
7					←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8						→			INVITE	IBCF_B forwards INVITE to IMS_B
9						←			100 Trying	IMS_B responds with a 100 Trying provisional response
10						←			408 Request Timeout or	**IMS_B responds to the INVITE with 4xx**
11					←				408 Request Timeout or	IBCF_B forwards 4xx response to IBCF_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
12				←					408 Request Timeout or	IBCF_A forwards 4xx response to IMS_A
13			←						408 Request Timeout or	**IMS_A forwards** 4xx **response to UE_A**
14		←								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 5.2.6.3.3 ¶1 (1st numbered list)
	TP_IMS_5070_01	TS 124 229 [1], clause 5.2.7.3 ¶3
	TP_IMS_5301_01	TS 124 229 [1], clause 5.4.3.3 ¶126 (10th numbered list)
	TP_IMS_5055_01	TS 124 229 [1], clause 5.2.6.4.4 ¶1 (1st numbered list)
	TP_IMS_5055_02	TS 124 229 [1], clause 5.2.6.4.4 ¶1 (1st numbered list
	TP_IMS_5108_01	TS 124 229 [1], clause 5.4.3.3 ¶5 (1st numbered list)
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 6 (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-value_parameter }* *}*
	2	TP_IMS_5070_01 in CFW step 13 (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_5301_01 in CFW step 13 (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* *containing an additional topmost Record-Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *}* *}*
	4	TP_IMS_5055_01 in CFW step 21 (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" }* *}*

Interoperability Test Description		
	5	TP_IMS_5055_02 in CFW step 31 (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"* *}* *}*
	6	TP_IMS_5108_01 in CFW step 12 (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-value_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-value_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**	**IMS A**	**IBCF A**	**IBCF B**	**IMS B**	**UE B**	**User B**		
1							←			User B calls User A
2			←						INVITE	UE_B sends INVITE with the first SDP offer indicating all desired medias and codecs that
3			→				→		100 Trying	IMS_A responds with a 100 Trying provisional response
4			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10					←				INVITE	IMS_B forwards INVITE to IBCF_B
11					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
12				←					INVITE	IBCF_B forwards INVITE to IBCF_A
13				→					100 Trying	IBCF_A responds with a 100 Trying provisional response

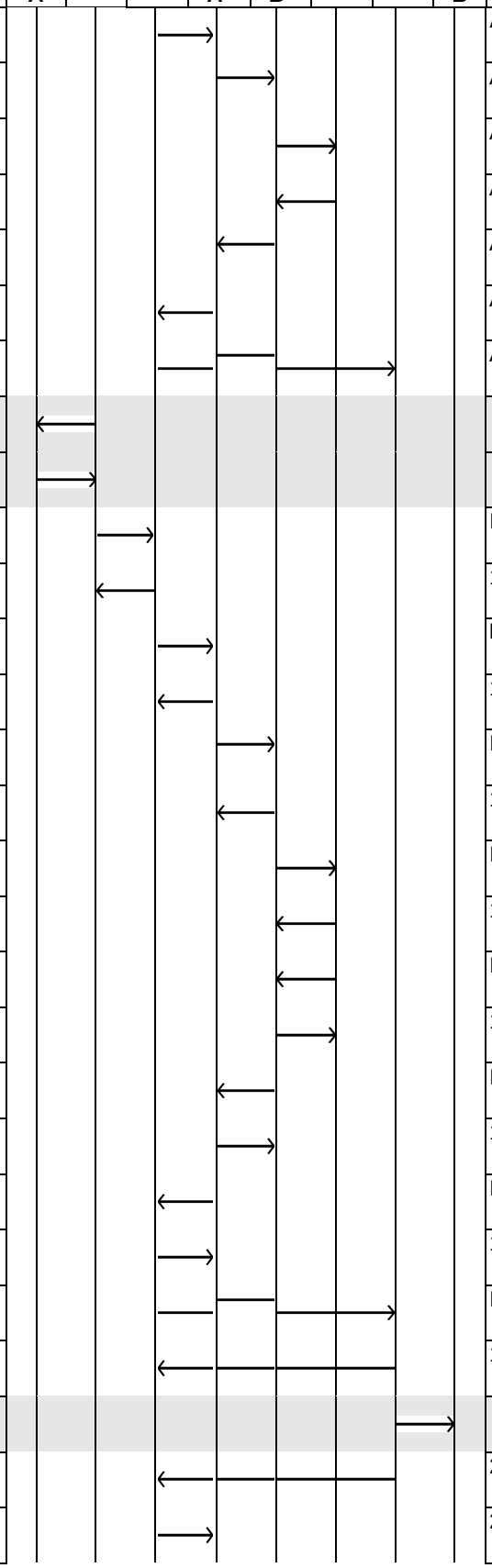
Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
14			←						INVITE	IBCF_A forwards INVITE to IMS_A
15			→						100 Trying	IMS_A responds with a 100 Trying provisional response
16		←							INVITE	IMS_A forwards INVITE to UE_A
17		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
18	←									User A is informed of incoming call of User B
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 180 Ringing response to IBCF_A**
21				→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
22					→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
23					←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
24				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
25			←						180 Ringing	IBCF_A forwards 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 200 OK response to IBCF_A**
31				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
32					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
33					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
34				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
35			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
36			→	→	→	→			200 OK	**IMS_A forwards 200 OK response to UE_B**
37							→			User B is presented that call in process
38			←	←	←	←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
39			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
40				→					ACK	IBCF_A forwards ACK to IBCF_B
41					→				ACK	IBCF_B forwards ACK to IMS_B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
42					←				ACK	IMS_B forwards ACK to IBCF_B
43				←					ACK	IBCF_B forwards ACK to IBCF_A
44			←						ACK	IBCF_A forwards ACK to IMS_A
45		←							ACK	IMS_A forwards ACK to UE_A
46	←									User A is informed that the call is in progress
47A	→									User A ends call
48A		→							BYE	UE_A releases the call with BYE
49A			→						**BYE**	**IMS_A forwards BYE to IBCF_A**
50A				→					BYE	IBCF_A forwards BYE to IBCF_B
51A					→				BYE	IBCF_B forwards BYE to IMS_B
53A					←				BYE	IMS_B forwards BYE to IBCF_B
54A				←					BYE	IBCF_B forwards BYE to IBCF_A
55A			←						BYE	IBCF_A forwards BYE to IMS_A
56A			→		→		→		BYE	IMS_A forwards BYE to UE_B
57A							→			User B is informed that call has ended
58A			←						200 OK	UE_B sends 200 OK for BYE
59A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
60A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
61A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
62A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
63A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
64A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
65A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
66A	←									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 ¶99 (item 3 and 5 in 7th numbered list)
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 59A and 94A (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 67A and 102A (200 OK): *ensure that {* *when { IMS_A receives a 200_response from UE_B }* *then { IMS_A sends the 200_response to IMS_B containing a P-Charging-Vector_header containing an updated access-network-charging-info_parameter }* *}*
	3	TP_IMS_5120_01 in CFW step 58A and 93A (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	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
46							→			User B is presented that call is in progress
47A	→									User A puts call on hold
48A		→							INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
49A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
50A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
51A			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
52A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
53A				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
54A					→				INVITE	IBCF_B forwards INVITE to IMS_B
55A					←				100 Trying	IMS_B responds with a 100 Trying provisional response
56A					←				INVITE	IMS_B forwards INVITE to IBCF_B
57A					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
58A				←					INVITE	IBCF_B forwards INVITE to IBCF_A
59A				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
60A			←						INVITE	IBCF_A forwards INVITE to IMS_A
61A			→						100 Trying	IMS_A responds with a 100 Trying provisional response
62A			→		→		→		INVITE	IMS_A forwards INVITE to UE_B
63A			←		←		←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
64A							→			User B is informed that call is on hold
65A			←		←		←		200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
66A			→						200 OK	**IMS_A forwards 200 OK response to IBCF_A**
67A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
68A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
69A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
70A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
71A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
72A		←							200 OK	**IMS_A forwards 200 OK response to UE_A**
73A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE



Step	Direction	Message	Comment
	User A / UEA / IMSA / IBCFA / IBCFB / IMSB / UEB / User B		
74A		**ACK**	**IMS_A forwards ACK to IBCF_A**
75A		ACK	IBCF_A forwards ACK to IBCF_B
76A		ACK	IBCF_B forwards ACK to IMS_B
77A		ACK	IMS_B forwards ACK to IBCF_B
78A		ACK	IBCF_B forwards ACK to IBCF_A
79A		ACK	IBCF_A forwards ACK to IMS_A
80A		ACK	IMS_A forwards ACK to UE_B
81A			User A is informed that call is on hold
82A			User A resumes call
83A		INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
84A		100 Trying	IMS_A responds with a 100 Trying provisional response
85A		**INVITE**	**IMS_A forwards INVITE to IBCF_A**
86A		100 Trying	IBCF_A responds with a 100 Trying provisional response
87A		INVITE	IBCF_A forwards INVITE to IBCF_B
88A		100 Trying	IBCF_B responds with a 100 Trying provisional response
89A		INVITE	IBCF_B forwards INVITE to IMS_B
90A		100 Trying	IMS_B responds with a 100 Trying provisional response
91A		INVITE	IMS_B forwards INVITE to IBCF_B
92A		100 Trying	IBCF_B responds with a 100 Trying provisional response
93A		INVITE	IBCF_B forwards INVITE to IBCF_A
94A		100 Trying	IBCF_A responds with a 100 Trying provisional response
95A		INVITE	IBCF_A forwards INVITE to IMS_A
96A		100 Trying	IMS_A responds with a 100 Trying provisional response
97A		INVITE	IMS_A forwards INVITE to UE_B
98A		100 Trying	UE_B optionally responds with a 100 Trying provisional response
99A			User B is informed that call is resumed
100A		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
101A		200 OK	IMS_A forwards 200 OK response to IBCF_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
102 A					→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
103 A						→			200 OK	IBCF_B forwards 200 OK response to IMS_B
104 A						←			200 OK	IMS_B forwards 200 OK response to IBCF_B
105 A					←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
106 A				←					200 OK	IBCF_A forwards 200 OK response to IMS_A
107 A			←						200 OK	IMS_A forwards the 200 OK response to UE_A
108 A		←								User B is informed that call has ended

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 5.2.6.3-9 ¶1 (1st numbered list)	
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 50B (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 and* *containing a P-Charging-Vector header* *containing an icid-value_parameter* *}* *}*	

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
48B			←						BYE	UE_B releases the call with BYE
49B			→						**BYE**	**IMS_A forwards BYE to IBCF_A**
50B				→					BYE	IBCF_A forwards BYE to IBCF_B
51B					→				BYE	IBCF_B forwards BYE to IMS_B
53B					←				BYE	IMS_B forwards BYE to IBCF_B
54B				←					BYE	IBCF_B forwards BYE to IBCF_A
55B			←						BYE	IBCF_A forwards BYE to IMS_A
56B		←							BYE	IMS_A forwards BYE to UE_A
57B	←									User A is informed that call has ended
58B		→							200 OK	UE_A sends 200 OK for BYE
59B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
60B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
61B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
62B					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
63B				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
64B			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
65B			→	→	→	→			200 OK	IMS_A forwards the 200 OK response to UE_A
66B							→			User B 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 5.2.6.3.5 ¶1 (1st numbered list)
	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 52B and 87B (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 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 52B and 87B (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	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
47B							←			User B puts call on hold
48B			←						INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
49B			→				→		100 Trying	IMS_A responds with a 100 Trying provisional response
50B			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
51B			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
52B				→					INVITE	IBCF_A forwards INVITE to IBCF_B
53B				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
54B					→				INVITE	IBCF_B forwards INVITE to IMS_B
55B					←				100 Trying	IMS_B responds with a 100 Trying provisional response
56B					←				INVITE	IMS_B forwards INVITE to IBCF_B
57B					→				100 Trying	IBCF_B responds with a 100 Trying provisional response
58B				←					INVITE	IBCF_B forwards INVITE to IBCF_A
59B				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
60B			←						INVITE	IBCF_A forwards INVITE to IMS_A
61B			→						100 Trying	IMS_A responds with a 100 Trying provisional response
62B		←							INVITE	IMS_A forwards INVITE to UE_A
63B		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
64B	←									User A is informed that call is on hold
65B		→							200 OK	UE_A responds to INVITE with 200 OK indicating attribute "recvonly" inactive
66B			→						200 OK	**IMS_A forwards 200 OK response to IBCF_A**
67B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
68B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
69B					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
70B				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
71B			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
72B			→				→		200 OK	**IMS_A forwards 200 OK response to UE_B**
73B			←						ACK	UE_B acknowledges the receipt of 200 OK for INVITE
74B			→						**ACK**	**IMS_A forwards ACK to IBCF_A**

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
75B				←					ACK	IBCF_A forwards ACK to IBCF_B
76B					→				ACK	IBCF_B forwards ACK to IMS_B
77B					←				ACK	IMS_B forwards ACK to IBCF_B
78B				←					ACK	IBCF_B forwards ACK to IBCF_A
79B			←						ACK	IBCF_A forwards ACK to IMS_A
80B		←							ACK	IMS_A forwards ACK to UE_A
81B	←									User A is informed that call is on hold
82B							←			User B resumes call
83B			←						INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
84B			→						100 Trying	IMS_A responds with a 100 Trying provisional response
85B				→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
86B			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
87B					→				INVITE	IBCF_A forwards INVITE to IBCF_B
88B				←					100 Trying	IBCF_B responds with a 100 Trying provisional response
89B						→			INVITE	IBCF_B forwards INVITE to IMS_B
90B						←			100 Trying	IMS_B responds with a 100 Trying provisional response
91B						←			INVITE	IMS_B forwards INVITE to IBCF_B
92B						→			100 Trying	IBCF_B responds with a 100 Trying provisional response
93B				←					INVITE	IBCF_B forwards INVITE to IBCF_A
94B				→					100 Trying	IBCF_A responds with a 100 Trying provisional response
95B			←						INVITE	IBCF_A forwards INVITE to IMS_A
96B			→						100 Trying	IMS_A responds with a 100 Trying provisional response
97B		←							INVITE	IMS_A forwards INVITE to UE_A
98B		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
99B	←									User A is informed that call is resumed
100B		→							200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "sendrecv"
101B			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
102B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
103B						→			200 OK	IBCF_B forwards 200 OK response to IMS_B
104B						←			200 OK	IMS_B forwards 200 OK response to IBCF_B
105B					←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
106B				←					200 OK	IBCF_A forwards 200 OK response to IMS_A
107B				→	→	→	→		200 OK	IMS_A forwards the 200 OK response to UE_B
108B							→			User B is informed that call has ended

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 50B and 68B (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	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
47B							←			User B puts call on hold
48B			←	←		←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
49B			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
50B				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
51B					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
52B					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
53B				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
54B			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
55B		←							UPDATE	IMS_A forwards UPDATE to UE_A
56B	←									User A is informed that call is on hold
57B		→							200 OK	UE_A responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
58B			→						200 OK	**IMS_A forwards 200 OK response to IBCF_A**
59B				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
60B					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
61B					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
62B				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
63B			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
64B			→	→	→	→	→		200 OK	**IMS_A forwards 200 OK response to UE_B**
65B							←			User B resumes call
66B			←	←		←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
67B			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
68B				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
69B					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
70B					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
71B				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
72B			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
73B		←							UPDATE	IMS_A forwards UPDATE to UE_A
74B	←									User A is informed that call is resumed

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
75B			→						200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
76B				→					200 OK	IMS_A forwards 200 OK response to IBCF_A
77B					→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
78B						→			200 OK	IBCF_B forwards 200 OK response to IMS_B
79B						←			200 OK	IMS_B forwards 200 OK response to IBCF_B
80B					←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
81B				←					200 OK	IBCF_A forwards 200 OK response to IMS_A
82B			→	→	→	→	→		200 OK	IMS_A forwards the 200 OK response to UE_B
83B							→			User B is informed that call has ended

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 ¶99 (item 3 and 5 in 7th numbered list)
Use Case ref.:	UC_03_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A configured to perform user initiated hold/resume using UPDATE • UE_A registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_A is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User A puts call on hold
	8	Verify that user B is informed that call is on hold
	9	Verify that user A is informed that call is on hold
	10	User A resumes call
	11	Verify that user B is informed that call is resumed
	12	Verify that user A is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5120_02 in CFW step 53A and 71A (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	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
47A		→								User A puts call on hold
48A			→						UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
49A				→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
50A					→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
51A						→			UPDATE	IBCF_B forwards UPDATE to IMS_B
52A						←			UPDATE	IMS_B forwards UPDATE to IBCF_B
53A					←				UPDATE	IBCF_B forwards UPDATE to IBCF_A
54A				←					UPDATE	IBCF_A forwards UPDATE to IMS_A
55A				→	→	→	→		UPDATE	IMS_A forwards UPDATE to UE_B
56A							→			User B is informed that call is on hold
57A				←			←		200 OK	UE_B responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
58A				→					200 OK	**IMS_A forwards 200 OK response to IBCF_A**
59A					→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
60A						→			200 OK	IBCF_B forwards 200 OK response to IMS_B
61A						←			200 OK	IMS_B forwards 200 OK response to IBCF_B
62A					←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
63A				←					200 OK	IBCF_A forwards 200 OK response to IMS_A
64A			←						200 OK	**IMS_A forwards 200 OK response to UE_A**
65A		→								User A resumes call
66A			→						UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
67A				→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
68A					→				UPDATE	IBCF_A forwards UPDATE to IBCF_B

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
69A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
70A					←				UPDATE	IMS_B forwards UPDATE to IBCF_B
71A				←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
72A			←						UPDATE	IBCF_A forwards UPDATE to IMS_A
73A			→	→	→	→	→		UPDATE	IMS_A forwards UPDATE to UE_B
74A							→			User A is informed that call is resumed
75A			←				←		200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
76A			→						200 OK	IMS_A forwards 200 OK response to IBCF_A
77A				→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
78A					→				200 OK	IBCF_B forwards 200 OK response to IMS_B
79A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
80A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
81A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
82A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
83A	←									User A is informed that call has ended

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_03	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
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	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User 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 24 (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	IBCF A	IBCF B	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
3			←						100 Trying	IMS_A responds with a 100 Trying provisional response
4				→					INVITE	IMS_A forwards INVITE to IBCF_A
5				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
6					→				INVITE	IBCF_A forwards INVITE to IBCF_B
7					←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8						→			INVITE	IBCF_B forwards INVITE to IMS_B
9						←			100 Trying	IMS_B responds with a 100 Trying provisional response
10							→		INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B
15					←				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16				←					180 Ringing	IBCF_A forwards 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 A cancels the call

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
20		→	→						CANCEL	UE_A sends a CANCEL to IMS_A
21		←	←						200 OK	IMS_A responds with a 200 OK to UE_A
22			→	→					**CANCEL**	**IMS_A forwards the CANCEL to IBCF_A**
23			←	←					200 OK	IBCF_A responds with a 200 OK to IMS_A
24				→	→				CANCEL	IBCF_A forwards the CANCEL to IBCF_B
25				←	←				200 OK	IBCF_B responds with a 200 OK to IBCF_A
26					→	→			CANCEL	IBCF_B forwards the CANCEL to IMS_B
27					←	←			200 OK	IMS_B responds with a 200 OK to IBCF_B
28						→	→		CANCEL	IMS_B forwards the CANCEL to UE_B
29						←	←		200 OK	UE_B responds with a 200 OK to IMS_B
30							→	→		User B is informed that call has been cancelled
31						←	←		487 Request Terminated	UE_B sends 487 Request Terminated to IMS_B
32						→	→		ACK	IMS_B responds with ACK to UE_B
33					←	←			487 Request Terminated	IMS_B forwards the 487 Request Terminated to IBCF_B
34					→	→			ACK	IBCF_B responds with ACK to IMS_B
35				←	←				487 Request Terminated	IBCF_B forwards the 487 Request Terminated to IBCF_A
36				→	→				ACK	IBCF_A responds with ACK to IBCF_B
37			←	←					487 Request Terminated	IBCF_A forwards the 487 Request Terminated to IMS_A
38			→	→					ACK	IMS_A responds with ACK to IBCF_A
39		←	←						487 Request Terminated	IMS_A forwards the 487 Request Terminated to UE_A
40		→	→						ACK	UE_A responds with ACK to IMS_A
41	←	←								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**
	TP_IMS_5073_01	TS 124 229 [1], clause 5.2.8.1.2 ¶1 (item 1 in 1st numbered list)
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 34 (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	IBCF A	IBCF B	IMS B	UE B	User B		
19		→								User A answers call
20			→						200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
21				→					200 OK	**IMS_A forwards the 200 OK response to IBCF_A**
22					→				200 OK	IBCF_A forwards the 200 OK response to IBCF_B
23						→			200 OK	IBCF_B forwards the 200 OK response to IMS_B
24							→		200 OK	IMS_B forwards the 200 OK to UE_B
25								→		User B is presented that call in process
26							←		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
27						←			ACK	IMS_B forwards ACK to IBCF_B
28					←				ACK	IBCF_B forwards ACK to IBCF_A
29				←					ACK	IBCF_A forwards ACK to IMS_A
30			←						ACK	IMS_A forwards ACK to UE_A
31		←								User A is informed that the call is in progress
32										UE_B looses connectivity
33						←			BYE	IMS_B forwards BYE to IBCF_B
34					←				BYE	IBCF_B forwards BYE to IBCF_A
35				←					BYE	IBCF_A forwards BYE to IMS_A
36			←						BYE	IMS_A forwards BYE to UE_A
37										User A is informed that call has ended
38			→						200 OK	UE_A sends 200 OK for BYE
39				→					200 OK	**IMS_A forwards the 200 OK response to IBCF_A**
40					→				200 OK	IBCF_A forwards the 200 OK response to IBCF_B
41						→			200 OK	IBCF_B forwards the 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 (item 1 and 2 in 1st numbered list)
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 34 (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	IBCF A	IBCF B	IMS B	UE B	User B		
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 the 200 OK response to IBCF_B**
22				←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
23			←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
24		←							200 OK	IMS_A forwards the 200 OK to UE_A
25	←									User A is presented that call in process
26		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27			→						ACK	IMS_A forwards ACK to IBCF_A
28				→					ACK	IBCF_A forwards ACK to IBCF_B
29					→				ACK	IBCF_B forwards ACK to IMS_B
30						→			ACK	IMS_B forwards ACK to UE_B
31							→			User B is informed that the call is in progress
32										UE_A is forced to be de-registered in IMS_A
33			→						BYE	IMS_A forwards BYE to IBCF_A
34				→					BYE	IBCF_A forwards BYE to IBCF_B
35					→				BYE	IBCF_B forwards BYE to IMS_B
36						→			BYE	IMS_B forwards BYE to UE_B
37							→			User B is informed that call has ended
38						←			200 OK	UE_B sends 200 OK for BYE
39					←				200 OK	**IMS_B forwards the 200 OK response to IBCF_B**
40				←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
41			←						200 OK	IBCF_A forwards the 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 ¶108 (6th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_01 in CFW step 37A and 60A (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 46A and 69A (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	IBCF A	IBCF B	IMS B	UE B	User B		
32A										User A puts call on hold
33A									INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
34A									100 Trying	IMS_A responds with a 100 Trying provisional response
35A									**INVITE**	**IMS_A forwards INVITE to IBCF_A**
36A									**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
37A									INVITE	IBCF_A forwards INVITE to IBCF_B
38A									100 Trying	IBCF_A responds with a 100 Trying provisional response
39A									INVITE	IBCF_B 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 on hold
44A									200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
45A									200 OK	**IMS_B forwards 200 OK response to IBCF_B**
46A									200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
47A									**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
48A									200 OK	IMS_A forwards the 200 OK response to UE_A
49A										User A is informed that call is on hold
50A									ACK	UE_A acknowledges the receipt of 200 OK for INVITE
51A									ACK	IMS_A forwards ACK to IBCF_A
52A									ACK	IBCF_A forwards ACK to IBCF_B
53A									ACK	IBCF_B forwards ACK to IMS_B
54A									ACK	IMS_B forwards ACK to UE_B
55A										User A resumes call
56A									INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
57A									100 Trying	IMS_A responds with a 100 Trying provisional response
58A									**INVITE**	**IMS_A forwards INVITE to IBCF_A**
59A									**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
60A									INVITE	IBCF_A forwards INVITE to IBCF_B
61A									100 Trying	IBCF_A responds with a 100 Trying provisional response
62A									INVITE	IBCF_B forwards INVITE to IMS_B
63A									100 Trying	IMS_B responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
64A						→			INVITE	IMS_B forwards INVITE to UE_B
65A						←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
66A							→			User B is informed that call is resumed
67A						←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
68A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
69A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
70A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
71A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
72A	←									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 ¶108 (6th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_02 (IMS_A) in CFW step 35A and 48A (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* *}* *}*
	2	TP_IMS_5121_02 (IMS_B) in CFW step 41A and 54A (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	IBCF A	IBCF B	IMS B	UE B	User B		
32A		→								User A puts call on hold
33A			→						UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
34A				→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
35A					→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
36A						→			UPDATE	IBCF_B forwards UPDATE to IMS_B
37A							→		UPDATE	IMS_B forwards UPDATE to UE_B
38A								→		User B is informed that call is on hold
39A						←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
40A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
41A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
42A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
43A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
44A	←									User A is informed that call is on hold
45A	→									User A resumes call
46A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
47A			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
48A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
49A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
50A						→			UPDATE	IMS_B 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_B forwards 200 OK response to IBCF_B**
54A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
55A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
56A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
57A	←									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 ¶108 (6th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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 (e.g. 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	

Interoperability Test Description		
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_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 37A: *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 38A, 46A (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 53A, 71 (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	IBCF A	IBCF B	IMS B	UE B	User B		
32A	→									User A adds a new media stream
33A		→							INVITE	UE_A sends reINVITE message with new media stream in SDP
34A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
35A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
36A			←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
37A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
38A				←					100 Trying	IBCF_A responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
39A						→			INVITE	IBCF_B 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								→		Verify that User B is informed to accept/reject new media stream (optional)
44A							←		180 Ringing	UE_B responds to reINVITE with 180 Ringing
45A						←			180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
46A					←				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
47A				←					180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
48A			←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
49A		←								Verify that User A is informed that UE_B is alerting User B (optional)
50A								←		If informed, User B accepts the new media stream
51A							←		200 OK	UE_B responds with 200 OK to reINVITE
52A						←			200 OK	**IMS_B forwards 200 OK response to IBCF_B**
53A					←				200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
54A				←					**200 OK**	**IBCF_A 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 new media stream has been accepted
57A			→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
58A				→					ACK	IMS_A forwards ACK to IBCF_A
59A					→				ACK	IBCF_A forwards ACK to IBCF_B
60A						→			ACK	IBCF_B forwards ACK to IMS_B
61A							→		ACK	IMS_B forwards ACK to UE_B
62		→							BYE	User A releases the call
63			→						BYE	UE_A sends BYE to indicate that the call has ended
64				→					BYE	IMS_A forwards the BYE to IBCF_A
65					→				BYE	IBCF_A forwards the BYE to IBCF_B
66						→			BYE	IBCF_B forwards the BYE to IMS_B

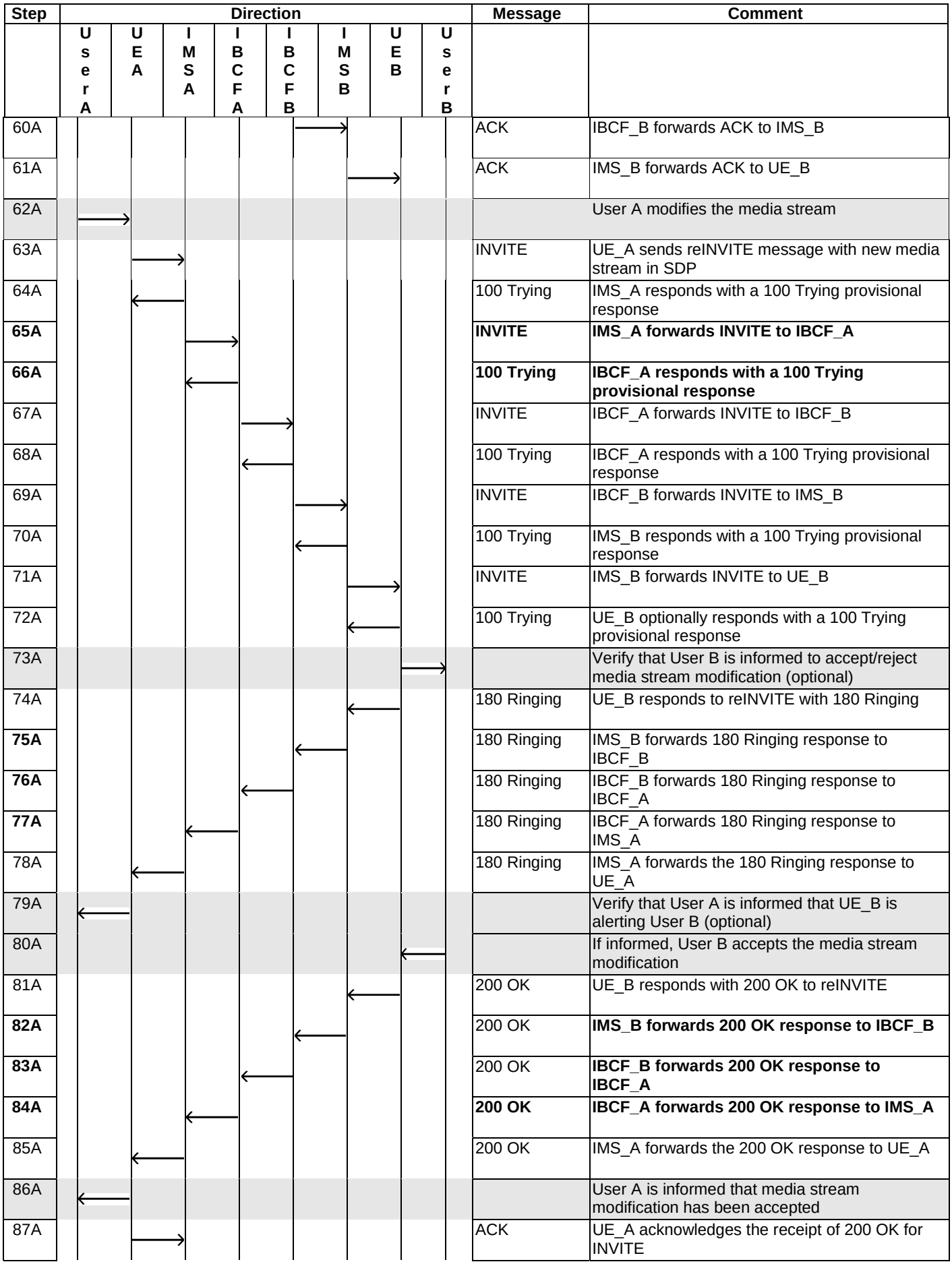
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
67						→			BYE	IMS_B forwards the BYE to UE_B
68							→			User B is informed that call has ended
69						←			200 OK	UE_B responds to the BYE with 200 OK
70					←				**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
71				←					**200 OK**	**IBCF_B forwards the 200 OK response to IBCF_A**
72			←						**200 OK**	**IBCF_A forwards the 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

4.5.3.1.3.7 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 ¶108 (6th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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 (e.g. 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	

Interoperability Test Description		
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 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	Verify that user A is informed that the call has ended
	19	Verify that user B is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_01 in CFW step 37A and 67A (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 38A, 68A (100 Trying) and 46A, 76A (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 53A and 83A (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	IBCF A	IBCF B	IMS B	UE B	User B		
32A										User A adds a new media stream
33A									INVITE	UE_A sends reINVITE message with new media stream in SDP
34A									100 Trying	IMS_A responds with a 100 Trying provisional response
35A									**INVITE**	**IMS_A forwards INVITE to IBCF_A**
36A									**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
37A									INVITE	IBCF_A forwards INVITE to IBCF_B
38A									100 Trying	IBCF_A responds with a 100 Trying provisional response
39A									INVITE	IBCF_B 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										Verify that User B is informed to accept/reject new media stream (optional)
44A									180 Ringing	UE_B responds to reINVITE with 180 Ringing
45A									180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
46A									180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
47A									180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
48A									180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
49A										Verify that User A is informed that UE_B is alerting User B (optional)
50A										If informed, User B accepts the new media stream
51A									200 OK	UE_B responds with 200 OK to reINVITE
52A									200 OK	**IMS_B forwards 200 OK response to IBCF_B**
53A									200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
54A									**200 OK**	**IBCF_A 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 new media stream has been accepted
57A									ACK	UE_A acknowledges the receipt of 200 OK for INVITE
58A									ACK	IMS_A forwards ACK to IBCF_A
59A									ACK	IBCF_A forwards ACK to IBCF_B



Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
60A						←			ACK	IBCF_B forwards ACK to IMS_B
61A							→		ACK	IMS_B forwards ACK to UE_B
62A	→									User A modifies the media stream
63A		→							INVITE	UE_A sends reINVITE message with new media stream in SDP
64A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
65A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
66A			←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
67A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
68A				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
69A					→				INVITE	IBCF_B forwards INVITE to IMS_B
70A					←				100 Trying	IMS_B responds with a 100 Trying provisional response
71A						→			INVITE	IMS_B forwards INVITE to UE_B
72A						←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
73A							→			Verify that User B is informed to accept/reject media stream modification (optional)
74A						←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
75A					←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
76A				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
77A			←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
78A		←							180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
79A	←									Verify that User A is informed that UE_B is alerting User B (optional)
80A							←			If informed, User B accepts the media stream modification
81A						←			200 OK	UE_B responds with 200 OK to reINVITE
82A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
83A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
84A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
85A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
86A	←									User A is informed that media stream modification has been accepted
87A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE

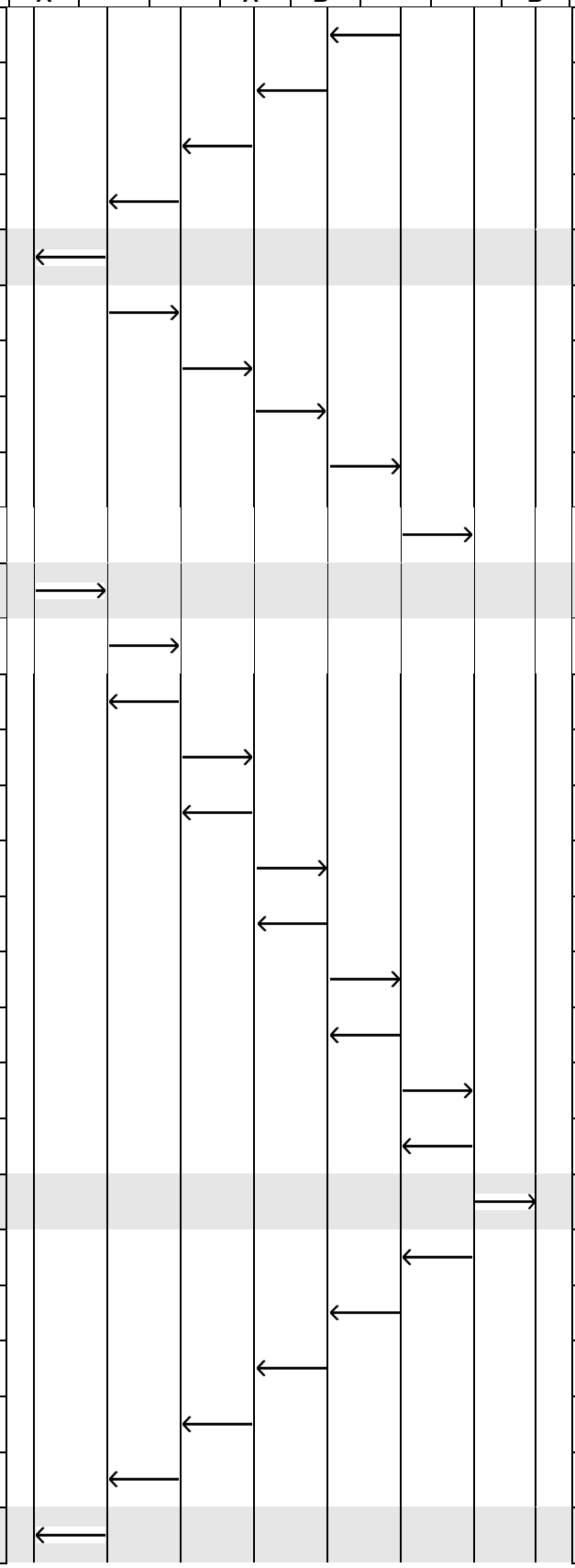
Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
88A			→						ACK	IMS_A forwards ACK to IBCF_A
89A				→					ACK	IBCF_A forwards ACK to IBCF_B
90A					→				ACK	IBCF_B forwards ACK to IMS_B
91A						→			ACK	IMS_B forwards ACK to UE_B
92							←		BYE	User B releases the call
93						←			BYE	UE_B sends BYE to indicate that the call has ended
94					←				BYE	IMS_B forwards the BYE to IBCF_B
95				←					BYE	IBCF_B forwards the BYE to IBCF_A
96			←						BYE	IBCF_A forwards the BYE to IMS_A
97		←							BYE	IMS_A forwards the BYE to UE_A
98	←									User A is informed that call has ended
99		→							200 OK	UE_A responds to the BYE with 200 OK
100			→						**200 OK**	**IMS_A forwards the 200 OK response to IBCF_A**
101				→					**200 OK**	**IBCF_A forwards the 200 OK response to IBCF_B**
102					→				**200 OK**	**IBCF_B forwards the 200 OK response to IMS_B**
103						→			200 OK	IMS_B forwards the 200 OK response to UE_B
104							→			User B is informed that call has ended

4.5.3.1.3.8 Hold/resume media streams (reINVITE)

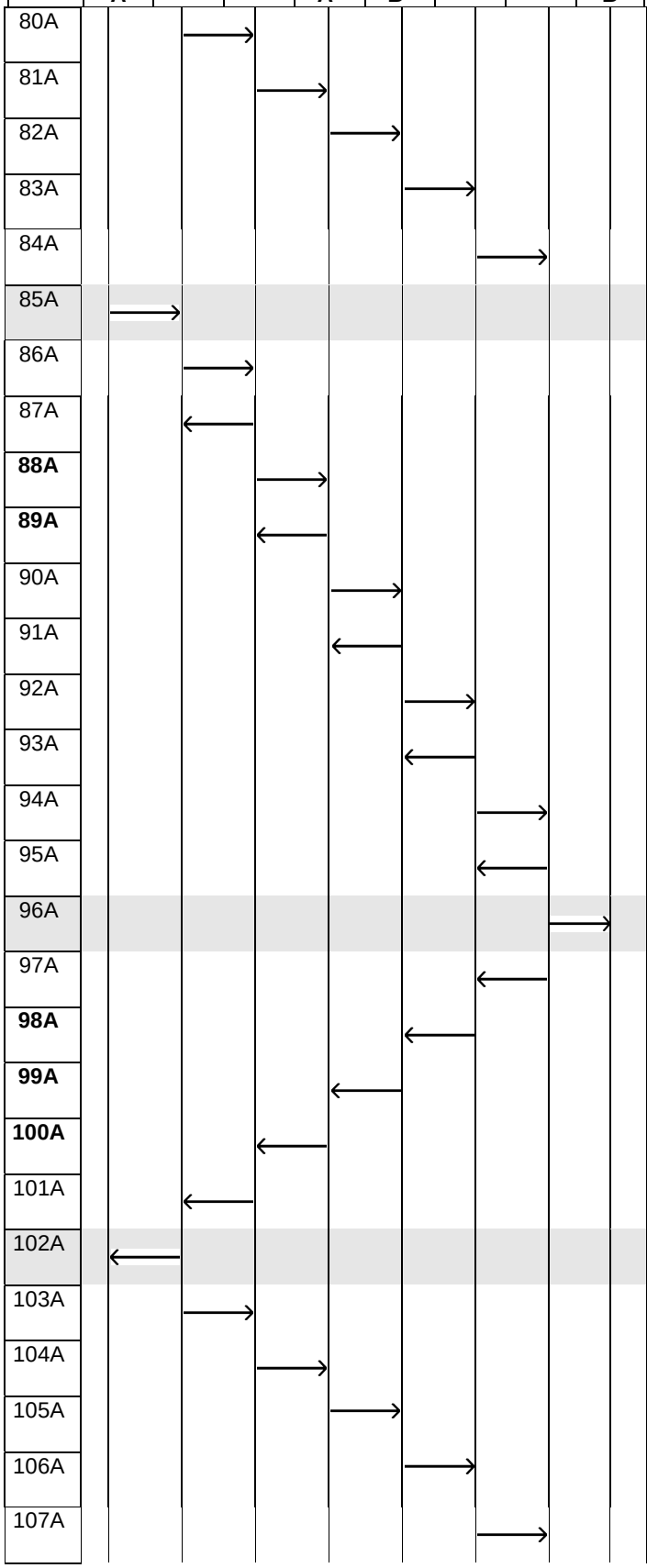
Interoperability Test Description		
Identifier:	TD_IMS_CALL_0021	
Summary:	IMS network handles subsequent INVITEs correctly during hold/resume of media streams	
Configuration:	CF_INT_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶108 (6th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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 (e.g. 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	Verify that user B is informed that media stream is on hold
	14	Verify that user A is informed that media stream is on hold
	15	User A resumes the media stream
	16	Verify that user B is informed that the media stream is resumed
	17	Verify that user A is informed that the media stream is resumed
	18	User A removes one of the media streams
	19	Verify that 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	Verify that user B is informed that call has ended
	23	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_01 in CFW step 37A, 67A, 90A, 113A (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 38A, 68A, 91A, 114A (100 trying), 122A (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 53A, 76A, 99A, 128A (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 }* *}*

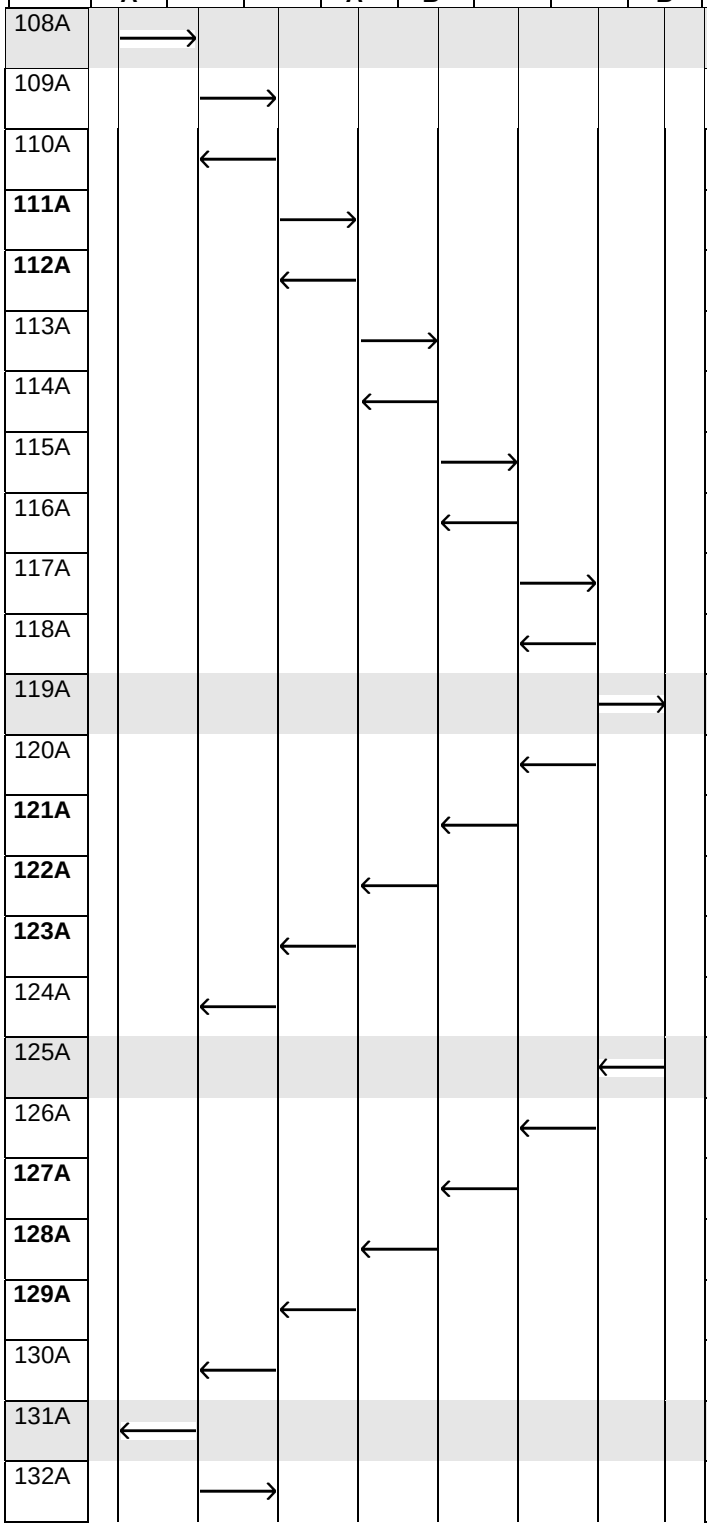
Step	Direction								Message	Comment
	User A	**UEA**	**IMSA**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
32A	→									User A adds a new media stream
33A		→	→						INVITE	UE_A sends reINVITE message with new media stream in SDP
34A		←	←						100 Trying	IMS_A responds with a 100 Trying provisional response
35A			→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
36A			←	←					**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
37A				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
38A				←	←				100 Trying	IBCF_A responds with a 100 Trying provisional response
39A					→	→			INVITE	IBCF_B 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							→	→		Verify that User B is informed to accept/reject new media stream (optional)
44A						←	←		180 Ringing	UE_B responds to reINVITE with 180 Ringing
45A					←	←			180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
46A				←	←				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
47A			←	←					180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
48A		←	←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
49A	←	←								Verify that User A is informed that UE_B is alerting User B (optional)
50A							←	←		If informed, User B accepts the new media stream
51A						←	←		200 OK	UE_B responds with 200 OK to reINVITE



Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
52A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
53A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
54A			←						**200 OK**	**IBCF_A 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 new media stream has been accepted
57A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
58A			→						ACK	IMS_A forwards ACK to IBCF_A
59A				→					ACK	IBCF_A forwards ACK to IBCF_B
60A					→				ACK	IBCF_B forwards ACK to IMS_B
61A						→			ACK	IMS_B forwards ACK to UE_B
62A	→									User A puts one media stream on hold
63A		→							INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
64A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
65A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
66A			←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
67A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
68A				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
69A					→				INVITE	IBCF_B forwards INVITE to IMS_B
70A					←				100 Trying	IMS_B responds with a 100 Trying provisional response
71A						→			INVITE	IMS_B forwards INVITE to UE_B
72A						←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
73A							→			User B is informed that media stream is on hold
74A						←			200 OK	UE_B responds with 200 OK to reINVITE
75A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
76A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
77A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
78A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
79A	←									User A is informed that media stream is on hold



Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
80A		→	→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
81A			→	→					ACK	IMS_A forwards ACK to IBCF_A
82A				→	→				ACK	IBCF_A forwards ACK to IBCF_B
83A					→	→			ACK	IBCF_B forwards ACK to IMS_B
84A						→	→		ACK	IMS_B forwards ACK to UE_B
85A	→	→								User A resumes the media stream
86A		→	→						INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
87A		←	←						100 Trying	IMS_A responds with a 100 Trying provisional response
88A			→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
89A			←	←					**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
90A				→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
91A				←	←				100 Trying	IBCF_A responds with a 100 Trying provisional response
92A					→	→			INVITE	IBCF_B forwards INVITE to IMS_B
93A					←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
94A						→	→		INVITE	IMS_B forwards INVITE to UE_B
95A						←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
96A							→	→		User B is informed that the media stream is resumed
97A						←	←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
98A					←	←			200 OK	**IMS_B forwards 200 OK response to IBCF_B**
99A				←	←				200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
100A			←	←					**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
101A		←	←						200 OK	IMS_A forwards the 200 OK response to UE_A
102A	←	←								User A is informed that media stream is resumed
103A		→	→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
104A			→	→					ACK	IMS_A forwards ACK to IBCF_A
105A				→	→				ACK	IBCF_A forwards ACK to IBCF_B
106A					→	→			ACK	IBCF_B forwards ACK to IMS_B
107A						→	→		ACK	IMS_B forwards ACK to UE_B



Step	Direction	Message	Comment
	User A / UE A / IMS A / IBCF A / IBCF B / IMS B / UE B / User B		
108A			User A removes one of the media streams
109A		INVITE	UE_A sends reINVITE to IMS_A
110A		100 Trying	IMS_A responds with a 100 Trying provisional response
111A		**INVITE**	**IMS_A forwards INVITE to IBCF_A**
112A		**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
113A		INVITE	IBCF_A forwards INVITE to IBCF_B
114A		100 Trying	IBCF_A responds with a 100 Trying provisional response
115A		INVITE	IBCF_B forwards INVITE to IMS_B
116A		100 Trying	IMS_B responds with a 100 Trying provisional response
117A		INVITE	IMS_B forwards INVITE to UE_B
118A		100 Trying	UE_B optionally responds with a 100 Trying provisional response
119A			User B is informed that the media stream has been removed
120A		180 Ringing	UE_B optionally responds to reINVITE with 180 Ringing
121A		180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
122A		180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
123A		180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
124A		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
125A			User A may be informed that UE_B is alerting User B (optional)
126A		200 OK	UE_B responds to INVITE with 200 OK with SDP where the port number for the video stream
127A		200 OK	**IMS_B forwards 200 OK response to IBCF_B**
128A		200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
129A		**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
130A		200 OK	IMS_A forwards the 200 OK response to UE_A
131A			User A is informed that new media stream has been removed
132A		ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
133A			→						ACK	IMS_A forwards ACK to IBCF_A
134A				→					ACK	IBCF_A forwards ACK to IBCF_B
135A					→				ACK	IBCF_B forwards ACK to IMS_B
136A						→			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_02	TS 124 229 [1], clause 5.4.3.2 ¶108 (6th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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 (e.g. 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	Verify that user B is informed that media stream is on hold
	14	Verify that user A is informed that media stream is on hold
	15	User A resumes the media stream
	16	Verify that user B is informed that the media stream is resumed
	17	Verify that user A is informed that the media stream is resumed
	18	User A removes one of the media streams
	19	Verify that user B is informed that the media stream has been removed
	20	User A releases the call

Interoperability Test Description		
	21	Verify that user Bis informed that call has ended
	22	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_02 in CFW step 65A, 78A and 101A (UPDATE): *ensure that {* *when { UE_A sends an UPDATE to UE_B }* *then { IMS_B receives the UPDATE* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI of IMS_A and* *not containing Route_header* *indicating the S-CSCF_SIP_URI of IMS_A and* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	2	TP_IMS_5121_02 (IMS_B) in CFW step 71A, 84A and 107A (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**	**IBCF A**	**IBCF B**	**IMS B**	**UE B**	**User B**		
62A	→									User A puts one media stream on hold
63A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
64A			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
65A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
66A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
67A						→			UPDATE	IMS_B forwards UPDATE to UE_B
68A								→		User B is informed that media stream is on hold
69A						←			200 OK	UE_B responds with 200 OK to UPDATE
70A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
71A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
72A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
73A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
74A	←									User A is informed that media stream is on hold
75A	→									User A resumes the media stream
76A		→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
77A			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
78A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
79A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
80A						→			UPDATE	IMS_B forwards UPDATE to UE_B
81A							→			User B is informed that the media stream is resumed
82A						←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
83A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
84A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
85A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
86A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
87A	←									User A is informed that media stream is resumed
88A	→									User A removes one of the media streams
99A		→							UPDATE	UE_A sends UPDATE to IMS_A
100A			→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
101A				→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
102A					→				UPDATE	IBCF_B forwards UPDATE to IMS_B
103A						→			UPDATE	IMS_B forwards UPDATE to UE_B
104A							→			User B is informed that the media stream has been removed
105A						←			200 OK	UE_B responds to INVITE with 200 OK
106A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
107A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
108A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
109A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
110A	←									User A is informed that new media stream has been removed

4.5.3.1.4 Dialogue Procedures - Topology Hiding

4.5.3.1.4.1 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 (after note 3)
	TP_IMS_5137_01	TS 124 229 [1], clause 5.10.4.2 ¶1 (item 7 & 8 in 1st numbered list)
	TP_IMS_5404_01	TS 124 229 [1], clause 5.10.2.2 ¶1 (item 8 in 1st numbered list)
	TP_IMS_5408_01	TS 124 229 [1], clause 5.10.2.3 ¶1 (item 4 in 1st numbered list)
	TP_IMS_5408_03	TS 124 229 [1], clause 5.10.2.3 ¶1 (item 4 in 1st numbered list)
	TP_IMS_5414_01	TS 124 229 [1], clause 5.10.3.2 ¶12 (item 1 in 1st numbered list)
	TP_IMS_5137_02	TS 124 229 [1], clause 5.10.4.2 ¶1 (1st numbered list)
	TP_IMS_5137_03	TS 124 229 [1], clause 5.10.4.2 ¶1 (1st numbered list)
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	Verify that user B is informed that the call is established
	7	User A ends the 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_5135_01 in CFW step 6 (INVITE): *ensure that {* *when { UE_A sends an 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 }* *}*

Interoperability Test Description		
	2	TP_IMS_5137_01 in CFW step 6 (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 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 6 (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 28 (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 35A (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 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 7 (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 15 (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 a Via_header* *indicating the IBCF_SIP_URI of IMS_A and* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*

Interoperability Test Description		
	8	TP_IMS_5137_03 in CFW step 22 and 41A (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* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
1										User A calls User B
2									INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3									100 Trying	IMS_A responds with a 100 Trying provisional response
4									**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5									100 Trying	IBCF_A responds with a 100 Trying provisional response
6									INVITE	IBCF_A forwards INVITE to IBCF_B
7									100 Trying	IBCF_B responds with a 100 Trying provisional response
8									INVITE	IBCF_B forwards INVITE to IMS_B
9									100 Trying	IMS_B responds with a 100 Trying provisional response
10									INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B**
15									180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16									180 Ringing	IBCF_A forwards 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 IBCF_B**
22									200 OK	IBCF_B forwards 200 OK response to IBCF_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
23			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
24		←							**200 OK**	**IMS_A forwards 200 OK response to UE_A**
25	←									User A is informed that call has been answered
26		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
27			→						**ACK**	**IMS_A forwards ACK to IBCF_A**
28				→					ACK	IBCF_A forwards ACK to IBCF_B
29					→				ACK	IBCF_B forwards ACK to IMS_B
30						→			ACK	IMS_B forwards ACK to UE_B
31							→			User B is informed that the call is established
32A	→									User A ends call
33A		→							BYE	UE_A releases the call with BYE
34A			→						**BYE**	**IMS_A forwards BYE to IBCF_A**
35A				→					BYE	IBCF_A forwards BYE to IBCF_B
36A					→				BYE	IBCF_B forwards BYE to IMS_B
37A						→			BYE	IMS_B forwards BYE to UE_B
38A							→			User B is informed that call has ended
39A						←			200 OK	UE_B sends 200 OK for BYE
40A					←				200 OK	IMS_B forwards 200 OK response to IBCF_B
41A				←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
42A			←						200 OK	IBCF_A forwards 200 OK response to IMS_A
43A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
44A	←									User B is informed that call has ended

4.5.3.1.4.2 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 (item 4 in 1st numbered list)
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 24 (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 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	IBCF A	IBCF B	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 IBCF_A**
5			←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6				→					INVITE	IBCF_A forwards INVITE to IBCF_B
7				←					100 Trying	IBCF_B responds with a 100 Trying provisional response

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
8					→				INVITE	IBCF_B forwards INVITE to IMS_B
9					←				100 Trying	IMS_B responds with a 100 Trying provisional response
10						→			INVITE	IMS_B forwards INVITE to UE_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
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 IBCF_B**
15				←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
16			←						180 Ringing	IBCF_A forwards 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
										User A cancels the Call
20		→							CANCEL	UE_A sends a CANCEL to IMS_A
21		←							200 OK	IMS_A responds with a 200 OK to UE_A
22			→						**CANCEL**	**IMS_A forwards the CANCEL to IBCF_A**
23			←						200 OK	IBCF_A responds with a 200 OK to IMS_A
24				→					CANCEL	IBCF_A forwards the CANCEL to IBCF_B
25				←					200 OK	IBCF_B responds with a 200 OK to IBCF_A
26					→				CANCEL	IBCF_B forwards the CANCEL to IMS_B
27					←				200 OK	IMS_B responds with a 200 OK to IBCF_B
28						→			CANCEL	IMS_B forwards the CANCEL to UE_B
29						←			200 OK	UE_B responds with a 200 OK to IMS_B
30							→			User B is informed that call has been cancelled
31						←			487 Request Terminated	UE_B sends 487 Request Terminated to IMS_B
32						→			ACK	IMS_B responds with ACK to UE_B
33					←				487 Request Terminated	IMS_B forwards the 487 Request Terminated to IBCF_B
34					→				ACK	IBCF_B responds with ACK to IMS_B
35				←					487 Request Terminated	IBCF_B forwards the 487 Request Terminated to IBCF_A

Step	Direction								Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	IMSB	UEB	User B		
36					→				ACK	IBCF_A responds with ACK to IBCF_B
37				←					487 Request Terminated	IBCF_A forwards the 487 Request Terminated to IMS_A
38				→					ACK	IMS_A responds with ACK to IBCF_A
39			←						487 Request Terminated	IMS_A forwards the 487 Request Terminated to UE_A
40			→						ACK	UE_A responds with ACK to IMS_A
41		←								User A is informed that call is terminated

4.5.3.1.4.3 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 (item 4 in 1st numbered list)
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
	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_5408_04 in CFW step 37A and 60A (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 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	IBCF A	IBCF B	IMS B	UE B	User B		
31										User B is presented that call is in progress
32A		→								User A puts call on hold
33A			→						INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
34A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
35A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
36A			←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
37A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
38A				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
39A					→				INVITE	IBCF_B 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 on hold
44A						←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
45A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
46A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
47A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
48A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
49A	←									User A is informed that call is on hold
50A		→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction								Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	IMS B	UE B	User B		
51A			→						ACK	IMS_A forwards ACK to IBCF_A
52A				→					ACK	IBCF_A forwards ACK to IBCF_B
53A					→				ACK	IBCF_B forwards ACK to IMS_B
54A						→			ACK	IMS_B forwards ACK to UE_B
55A	→									User A resumes call
56A		→							INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
57A		←							100 Trying	IMS_A responds with a 100 Trying provisional response
58A			→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
59A			←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
60A				→					INVITE	IBCF_A forwards INVITE to IBCF_B
61A				←					100 Trying	IBCF_A responds with a 100 Trying provisional response
62A					→				INVITE	IBCF_B forwards INVITE to IMS_B
63A					←				100 Trying	IMS_B responds with a 100 Trying provisional response
64A						→			INVITE	IMS_B forwards INVITE to UE_B
65A						←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
66A							→			User B is informed that call is resumed
67A						←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
68A					←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
69A				←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
70A			←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
71A		←							200 OK	IMS_A forwards the 200 OK response to UE_A
72A	←									User A 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 ¶11 (item 9 in 1st numbered list)
	TP_IMS_5117_02	TS 124 229 [1], clause 5.4.3.3 ¶100 (item 2 in 5th numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 6th numbered list)
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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see Table 6.1 and Table 6.3)	
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 4 (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-value_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 4 (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 10 (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 an access-network-charging-info_parameter }* *}*

Interoperability Test Description		
	4	TP_IMS_5118_01 in CFW step 10 (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**	**IBCF A**	**IBCF B**	**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 IBCF_A**
4					→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5						→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
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 IBCF_B**
10				←					200 OK	**IBCF_B sends 200 OK to IBCF_A**
11			←						**200 OK**	**IBCF_A sends 200 OK to IMS_A**
12		←							200 OK	IMS_A sends 200 OK to UE_A
13	←									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 ¶100 (item 2 in 5th numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 6th numbered list)
	TP_IMS_5117_06	TS 124 229 [1], clause 5.4.3.3 ¶100 (item 1 in 5th numbered list)
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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see Table 6.1 and Table 6.3)	
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 4 (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 }* *}*
	2	TP_IMS_5117_02 in CFW step 10 (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 10 (200 OK) *ensure that {* *when { UE_B sends 200_response to UE_A }* *then { IMS_A receives the 200_response* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B }* *}*

Interoperability Test Description		
	4	TP_IMS_5117_06 in CFW step 10 (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**	**IBCF A**	**IBCF B**	**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 IBCF_A**
4					→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5						→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
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 IBCF_B**
10				←					200 OK	**IBCF_B sends 200 OK to IBCF_A**
11			←						**200 OK**	**IBCF_A sends 200 OK to IMS_A**
12		←							200 OK	IMS_A sends 200 OK to UE_A
13	←									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 ¶11 (item 10 in 1st numbered)
	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 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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see tables 6.1 and 6.3)	
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 6 (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 12 (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	IBCF A	IBCF B	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			→							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 IBCF_A**
6					←	→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
7						←	→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
8							←	→		MESSAGE	IMS_B sends MESSAGE to UE_B
9								→			User B is informed about the instant message
10							←			200 OK	UE_B sends 200 OK to IMS_B
11						←				200 OK	**IMS_B sends 200 OK to IBCF_B**
12				←	←					200 OK	**IBCF_B sends 200 OK to IBCF_A**
13			←							**200 OK**	**IBCF_A sends 200 OK to IMS_A**
14		←								200 OK	IMS_A sends 200 OK to UE_A
15	←										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 ¶5 (1st numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 6th numbered list)
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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see tables 6.1 and 6.3)	
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 7 (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-value_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-value_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 16 (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	IBCF A	IBCF B	IMS B	UE B	User B		
1							←			User B sends an instant message to user A
2			←	—	—				MESSAGE	UE_B sends MESSAGE to IMS_A
3			→						**MESSAGE**	**IMS_A sends MESSAGE to IBCF_A**
4				→					MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5					→				MESSAGE	IBCF_B sends MESSAGE to IMS_B
6					←				MESSAGE	IMS_B sends MESSAGE to IBCF_B
7				←					MESSAGE	IBCF_B sends MESSAGE to IBCF_A
8			←						MESSAGE	IBCF_A sends MESSAGE to IMS_A
9		←							MESSAGE	IMS_A sends MESSAGE to UE_A
10	←									User A is informed about the instant message
11		→							200 OK	UE_A sends 200 OK to IMS_A
12			→						200 OK	**IMS_A sends 200 OK to IBCF_A**
13				→					200 OK	**IBCF_A sends 200 OK to IBCF_B**
14					→				**200 OK**	**IBCF_B sends 200 OK to IMS_B**
15					←				200 OK	IMS_B sends 200 OK to IBCF_B
16				←					200 OK	IBCF_B sends 200 OK to IBCF_A
17			←						200 OK	IBCF_A sends 200 OK to IMS_A
18			→	—	—	→			200 OK	IMS_A sends 200 OK to UE_B
19							→			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 ¶85 (item 3 in 3rd numbered list)
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" • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see tables 6.1 and 6.3)	
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 10 (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**	**IBCF A**	**IBCF B**	**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 IBCF_A**
4				→					MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5					→				MESSAGE	IBCF_B sends MESSAGE to IMS_B
7										IMS_B detects that user B is not registered
9					←				4xx Response	**IMS_B sends 4xx Response to IBCF_B**
10				←					4xx Response	**IBCF_B forwards 4xx Response to IBCF_A**
11			←						4xx Response	**IBCF_A forwards 4xx Response to IMS_A**
12		←							4xx Response	IMS_A forwards 4xx Response to UE_A
13	←									Optional: User A is presented a delivery report

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 ¶6 (item 1 in1st numbered list)
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 • MESSAGE request and response has to be supported at II-NNI (TS 129 165 [16] see tables 6.1 and 6.3)	
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 10 (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	IBCF A	IBCF B	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 IBCF_A**
4				→					MESSAGE	IBCF_A sends MESSAGE to IBCF_B
5					→				MESSAGE	IBCF_B sends MESSAGE to IMS_B
7										IMS_B detects that user B is not registered
9						←			404 Not Found	**IMS_B sends 404 Response to IBCF_B**
10					←				404 Not Found	**IBCF_B forwards 404 Response to IBCF_A**
11				←					404 Not Found	**IBCF_A forwards 404 Response to IMS_A**
12		←							404 Not Found	IMS_A forwards 404 Response to UE_A
13	←									Optional: User A is presented a delivery report

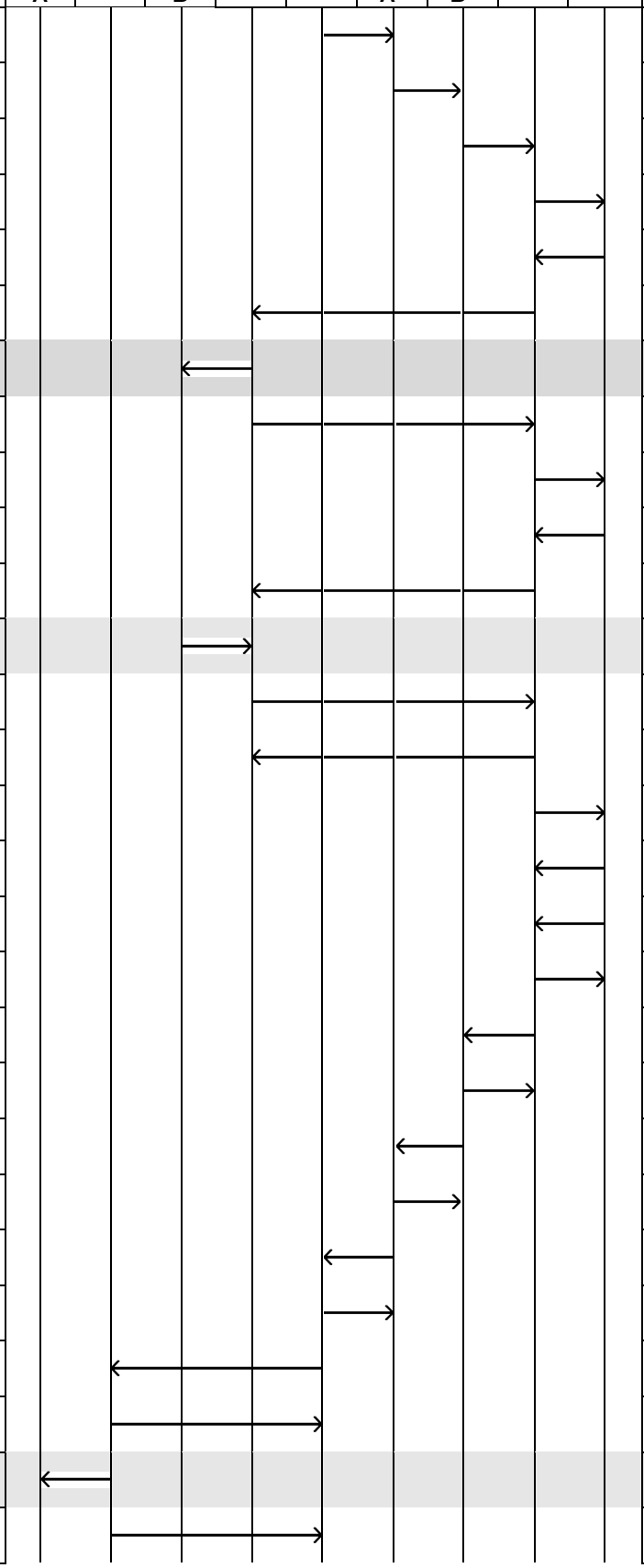
4.5.5 Supplementary Services

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**	**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_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 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 35 (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 50 and Step 52 (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* *}* *}*

Interoperability Test Description		
	3	TP_IMS_5310_01 in CFW step 63 (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 78 and Step 80 (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	**UEA**	**User B**	**UEB**	**IMSA**	**IBCFA**	**IBCFB**	**IMSB**	**ASB**		
32			→								User B puts call on hold
33				→				→		**INVITE**	**UE_B sends reINVITE message indicating media attribute "sendonly"**
34				←				←		100 Trying	IMS_B responds with a 100 Trying provisional response
35								→		**INVITE**	**IMS_B sends reINVITE to AS_B**
36								←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
37								←		INVITE	AS_B sends reINVITE to IMS_B
38								→		100 Trying	IMS_B responds with a 100 Trying provisional response
39							←			INVITE	IMS_B forwards reINVITE to IBCF_B
40							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
41						←				INVITE	IBCF_B forwards reINVITE to IBCF_A
42						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
43					←					INVITE	IBCF_A forwards reINVITE to IMS_A
44					→					100 Trying	IMS_A responds with a 100 Trying provisional response
45		←		←						INVITE	IMS_A forwards reINVITE to UE_A
46		→		→						100 Trying	UE _A optionally responds with a 100 Trying provisional response
47	←										User A is informed that call is on hold with AS tone
48		→		→						200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"



Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / IBCF A / IBCF B / IMS B / AS B		
49		200 OK	**IMS_A forwards 200 OK response to IBCF_A**
50		200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
51		**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
52		**200 OK**	**IMS_B forwards 200 OK response to AS_B**
53		200 OK	AS_B forwards 200 OK response to IMS_B
54		200 OK	IMS_A forward the 200 OK to UE_B
55			User B is informed that the call is on hold
56		ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
57		ACK	IMS_B forwards ACK to AS_B
58		ACK	AS_B forwards ACK to IMS_B
59		ACK	IMS_B forwards ACK to UE_B
60			User B resumes call
61		**INVITE**	**UE_B sends second reINVITE message indicating media attribute**
62		100 Trying	IMS_B responds with a 100 Trying provisional response
63		**INVITE**	**IMS_B sends reINVITE to AS_B**
64		100 Trying	AS_B optionally responds with a 100 Trying provisional response
65		INVITE	AS_B forwards INVITE to IMS_B
66		100 Trying	IMS_B responds with a 100 Trying provisional response
67		INVITE	IMS_B sends reINVITE to IBCF_B
68		100 Trying	IBCF_B responds with a 100 Trying provisional response
69		INVITE	IBCF_B sends reINVITE to IBCF_A
70		100 Trying	IBCF_A responds with a 100 Trying provisional response
71		INVITE	IBCF_A sends reINVITE to IMS_A
72		100 Trying	IMS_A responds with a 100 Trying provisional response
73		INVITE	IMS_A forwards reINVITE to UE_A
74		100 Trying	UE_A optionally responds with a 100 Trying provisional response
75			User A is informed that call is resumed
76		200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A

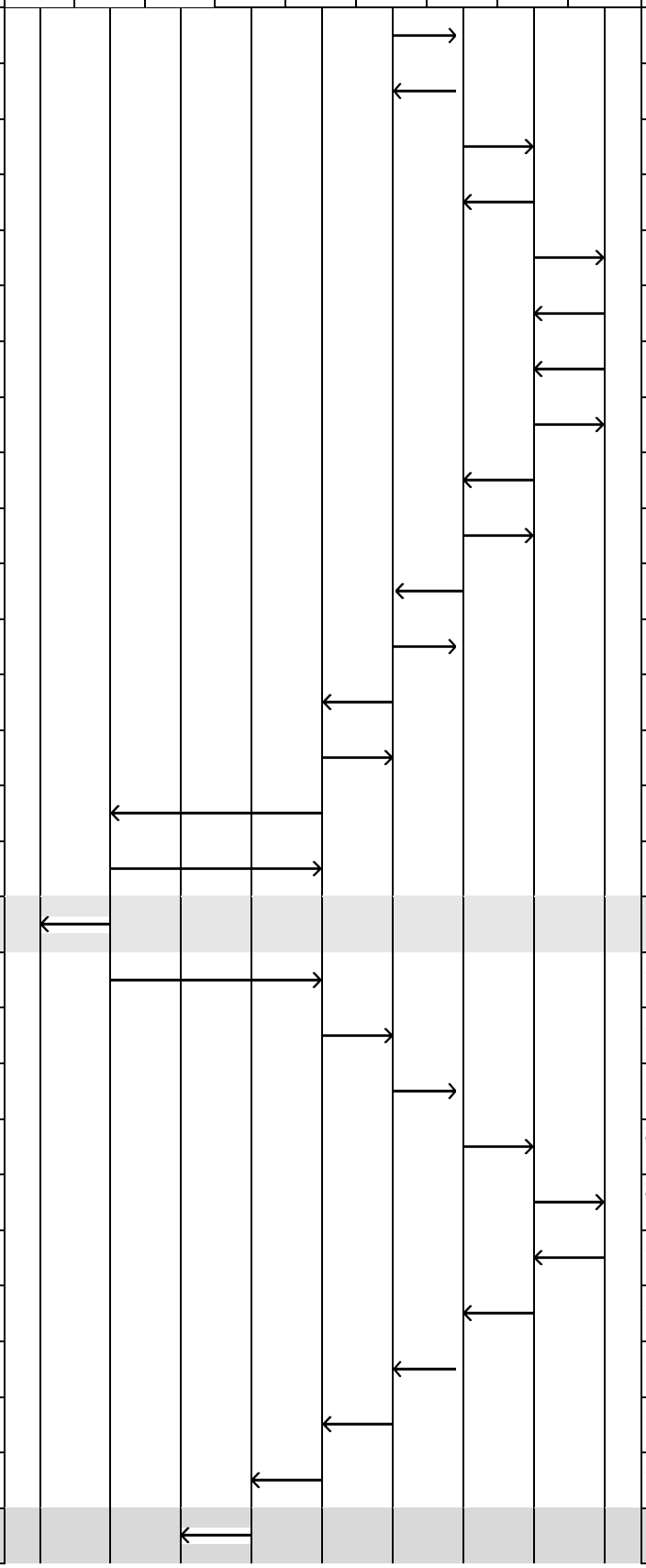
Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
77					→	→	→	→		200 OK	**IMS_A forwards 200 OK response to IBCF_A**
78						→	→	→		200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
79							→	→		**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
80								→		**200 OK**	**IMS_B forwards 200 OK response to AS_B**
81								←		200 OK	AS_B forwards the 200 OK for INVITE
82				←	←	←	←			200 OK	IMS_B forwards 200 OK to IMS_A
83			←								User B is informed that call is resumed

4.5.5.2 Supplementary Service HOLD with AS in roaming

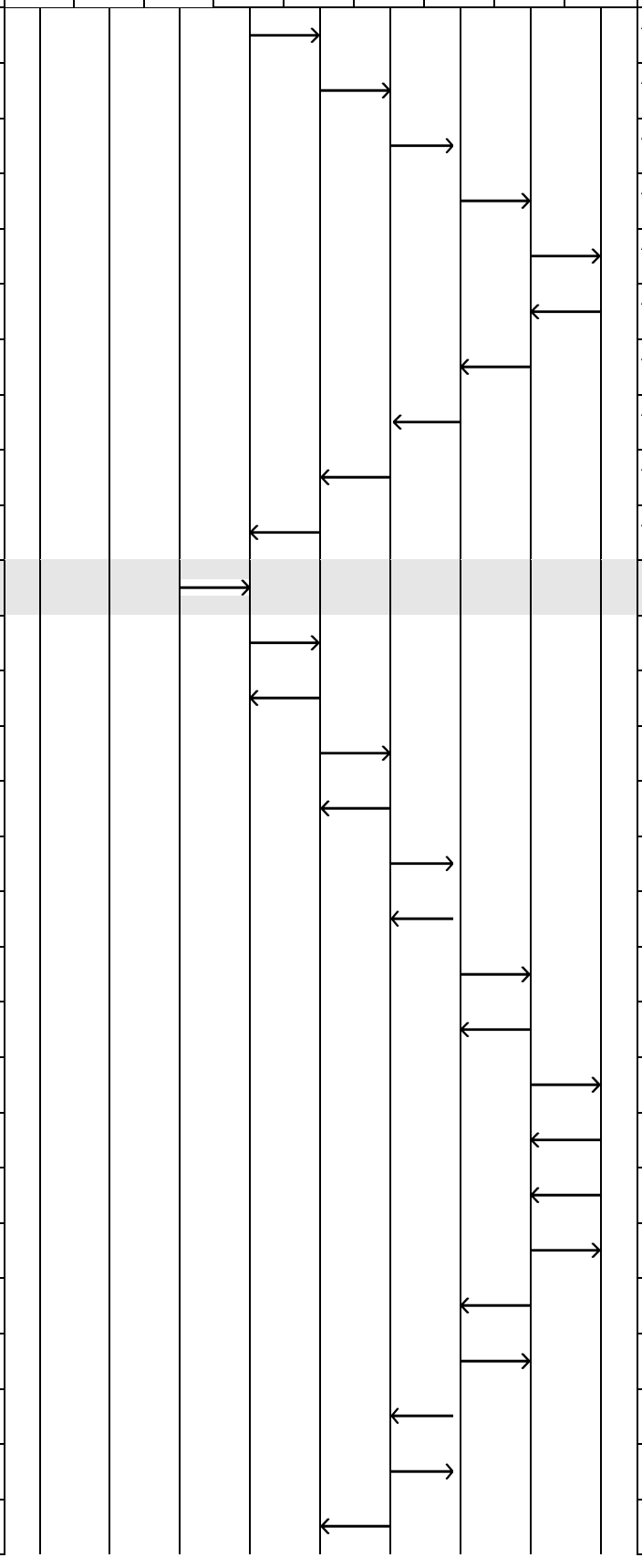
Interoperability Test Description		
Identifier:	TD_IMS_SS_0002	
Summary:	IMS network supports properly application services based on the example of the HOLD supplementary service	
Configuration:	CF_ROAM_AS	
SUT	IMS_B	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5310_01	TS 124 229 [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
	8	Verify that user A is informed that call on hold with AS tone
	9	Verify that user B is informed that call on hold
	10	User B resumes call
	11	Verify that user A is informed that call is resumed
	12	Verify that user B is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5310_01 in CFW step 52 and Step 56 (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 71 and Step 73 (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 95 and Step 99 (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 110 and Step 112 (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	**UEA**	**User B**	**UEB**	**IMSA**	**IBCFA**	**IBCFB**	**IMSB**	**ASB**		
47			→								User B puts call on hold
48				→						**INVITE**	**UE_B sends reINVITE message indicating media attribute "sendonly"**
49				←						100 Trying	IMS_A responds with a 100 Trying provisional response
50					→					INVITE	IMS_A forwards INVITE to IBCF_A
51					←					100 Trying	**IBCF_A responds with a 100 Trying provisional response**



Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / IBCF A / IBCF B / IMS B / AS B		
52		INVITE	IBCF_A forwards INVITE to IBCF_B
53		100 Trying	**IBCF_B responds with a 100 Trying provisional response**
54		INVITE	IBCF_B forwards INVITE to IMS_B
55		100 Trying	IMS_B responds with a 100 Trying provisional response
56		**INVITE**	**IMS_B sends reINVITE to AS_B**
57		100 Trying	AS_B optionally responds with a 100 Trying provisional response
58		INVITE	AS_B sends reINVITE to IMS_B
59		100 Trying	IMS_B responds with a 100 Trying provisional response
60		INVITE	IMS_B forwards reINVITE to IBCF_B
61		100 Trying	IBCF_B responds with a 100 Trying provisional response
62		INVITE	IBCF_B forwards reINVITE to IBCF_A
63		100 Trying	IBCF_A responds with a 100 Trying provisional response
64		INVITE	IBCF_A forwards reINVITE to IMS_A
65		100 Trying	IMS_A responds with a 100 Trying provisional response
66		INVITE	IMS_A forwards reINVITE to UE_A
67		100 Trying	UE _A optionally responds with a 100 Trying provisional response
68			User A is informed that call is on hold with AS tone
69		200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
70		200 OK	**IMS_A forwards 200 OK response to IBCF_A**
71		200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
72		**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
73		**200 OK**	**IMS_B forwards 200 OK response to AS_B**
74		200 OK	AS_B forwards 200 OK response to IMS_B
75		200 OK	IMS_B forwards 200 OK response to IBCF_B
76		200 OK	IBCF_B forwards 200 OK response to IBCF_A
77		200 OK	IBCF_A forwards 200 OK response to IMS_A
78		200 OK	IMS_A forward the 200 OK to UE_B
79			User B is informed that the call is on hold



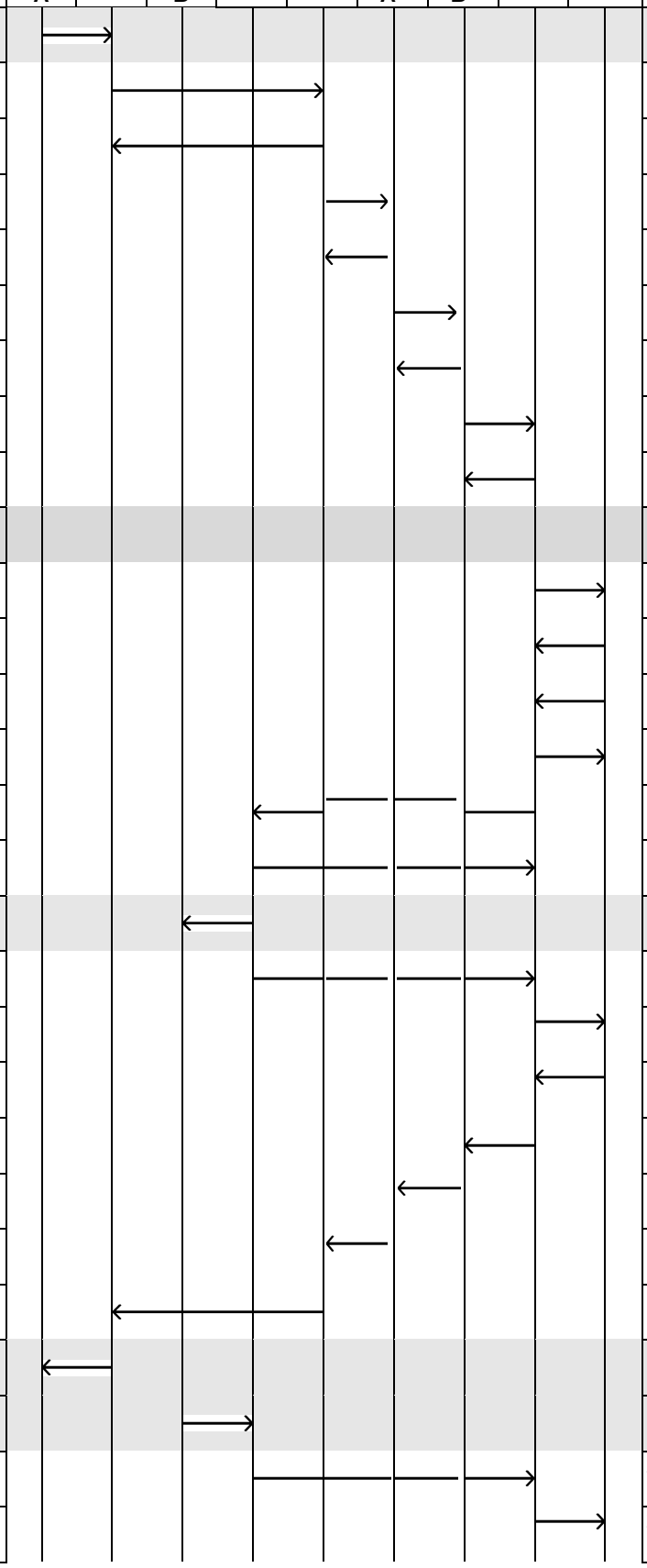
Step	Direction	Message	Comment
	User A / UE A / User B / UE B / IMS A / IBCF A / IBCF B / IMS B / AS B		
80		ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
81		ACK	IMS_A forwards ACK to IBCF_A
82		ACK	IBCF_A forwards ACK to IBCF_B
83		ACK	IBCF_A forwards ACK to IMS_B
84		ACK	IMS_B forwards ACK to AS_B
85		ACK	AS_B forwards ACK to IMS_B
86		ACK	IMS_B forwards ACK to IBCF_B
87		ACK	IBCF_B forwards ACK to IBCF_A
88		ACK	IBCF_A forwards ACK to IMS_A
89		ACK	IMS_A forwards ACK to UE_B
90			User B resumes call
91		**INVITE**	**UE_B sends second reINVITE message indicating media attribute "sendrecv"**
92		100 Trying	IMS_A responds with a 100 Trying provisional response
93		INVITE	IMS_A sends reINVITE to IBCF_A
94		100 Trying	IBCF_A responds with a 100 Trying provisional response
95		INVITE	IBCF_A sends reINVITE to IBCF_B
96		100 Trying	IBCF_B responds with a 100 Trying provisional response
97		INVITE	IBCF_B sends reINVITE to IMS_B
98		100 Trying	IMS_B responds with a 100 Trying provisional response
99		**INVITE**	**IMS_B sends reINVITE to AS_B**
100		100 Trying	AS_B optionally responds with a 100 Trying provisional response
101		INVITE	AS_B forwards INVITE to IMS_B
102		100 Trying	IMS_B responds with a 100 Trying provisional response
103		INVITE	IMS_B sends reINVITE to IBCF_B
104		100 Trying	IBCF_B responds with a 100 Trying provisional response
105		INVITE	IBCF_B forwards reINVITE to IBCF_A
106		100 Trying	IBCF_A responds with a 100 Trying provisional response
107		INVITE	IBCF_A forwards reINVITE to IMS_A

Step	Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS B		
108										100 Trying	IMS_A responds with a 100 Trying provisional response
109										INVITE	IMS_A forwards reINVITE to UE_A
110										100 Trying	UE_A optionally responds with a 100 Trying provisional response
107											User A is informed that call is resumed
108										200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
109										200 OK	**IMS_A forwards 200 OK response to IBCF_A**
110										200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
111										**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
112										**200 OK**	**IMS_B forwards 200 OK response to AS_B**
113										200 OK	AS_B forwards the 200 OK for INVITE
114										200 OK	IMS_B forwards 200 OK to IBCF_B
115										200 OK	IBCF_B forwards 200 OK to IBCF_A
116										200 OK	IBCF_A forwards 200 OK to IMS_A
117										200 OK	IMS_A forwards 200 OK to UE_B
118											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 ¶11 (item 9 in 1st numbered list)
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶89 (4th numbered list)
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	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userOIP in IMS_B)
	2	Verify that user B is informed of incoming call of User A, user A's identity is displayed
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that the call is established
	7	User A ends call
	8	Verify that user B is informed that call has ended
	9	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 6 (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 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 }* *}*
	3	TP_IMS_5115_08 in CFW step 30 (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	IBCF A	IBCF B	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**
3										100 Trying	IMS_A responds with a 100 Trying provisional response
4										**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5										**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
6										**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7										**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
8										**INVITE**	**IBCF_B forwards 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	AS optionally responds with a 100 Trying provisional response
12										INVITE	IMS_B AS returns, possibly modified, INVITE 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
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 displayed
17										180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started
18										180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
19										180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
20										180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
21										180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
22										180 Ringing	IBCF_A forwards the 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 200 OK response to IMS_B AS

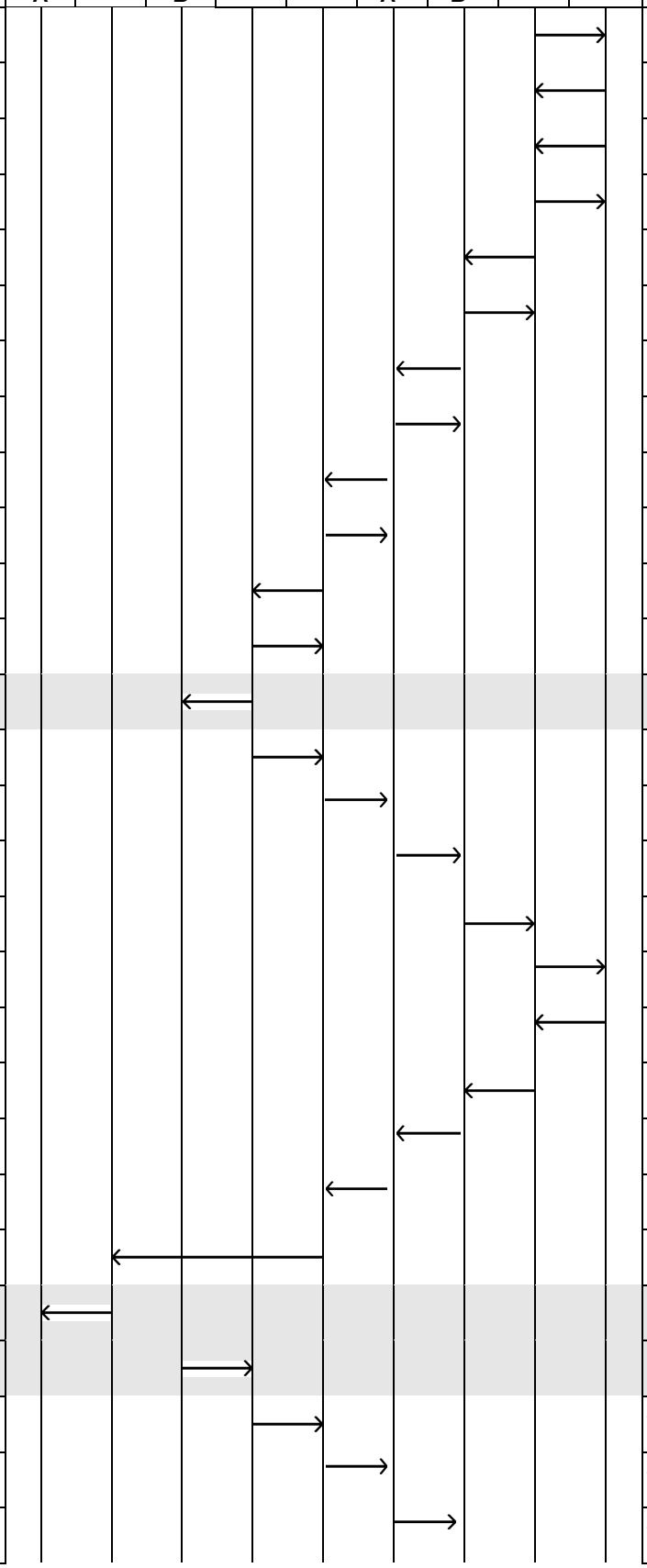
Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
28	←									**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
29							←			**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
30						←				200 OK	IBCF_B forwards the 200 OK response to IBCF_A
31					←					200 OK	IBCF_A forwards the 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

4.5.5.4 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 ¶11 (item 9 in 1st numbered list)
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶89 (4th numbered list)
Use Case ref.:	UC_08_R	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B via IMS_A using userOIP identity according to table 1 • IMS_B is configured to contact AS_B (OIP) • UE_B is subscribed to OIP service	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userOIP in IMS_B)
	2	Verify that user B is informed of incoming call of User A, user A's identity is displayed
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that the call is established
	7	User A ends call
	8	Verify that user B is informed that call has ended
	9	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 6 (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 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 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 37 (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	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
1											User A calls User B
2										**INVITE**	**UE_A sends INVITE with the first SDP offer indicating all desired media and**
3										100 Trying	IMS_A responds with a 100 Trying provisional response
4										**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5										**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
6										**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7										**100 Trying**	**IBCF_B 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 OIP IFC in IMS_B



Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
10										**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
11										100 Trying	AS optionally responds with a 100 Trying provisional response
12										INVITE	IMS_B AS returns, possibly modified, INVITE 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_B forwards INVITE to IBCF_B
17										100 Trying	IBCF_A responds with a 100 Trying provisional response
18										INVITE	IBCF_B forwards INVITE to IBCF_A
19										100 Trying	IBCF_A responds with a 100 Trying provisional response
20										INVITE	IMS_A forwards the INVITE to UE_B
21										100 Trying	UE_B optionally responds with a 100 Trying provisional response
22											User B is informed of incoming call of User A, User A's identity is displayed
23										180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
24										180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
25										180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
26										180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
27										180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
28										180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
29										180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
30										180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
31										180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
32										180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
33											User A is informed that UE_B is ringing
34											User B answers call
35										200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
36										200 OK	IMS_A forwards 200 OK response to IBCF_A
37										200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	IMSB	ASB		
38							→	→		200 OK	IBCF_B forwards 200 OK response to IMS_B
39								→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
40								←		**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
41							←			**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
42						←				200 OK	IBCF_B forwards the 180 Ringing response to IBCF_A
43					←					200 OK	IBCF_A forwards the 180 Ringing response to IMS_A
44		←								200 OK	IMS_A forwards the 200 OK response to UE_A
45	←										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 ¶5 (item 4 in 1st numbered list)
	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
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_03 in CFW step 14 (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 }* *}*

Interoperability Test Description		
	2	TP_IMS_5313_01 in CFW step 20 (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	**UEA**	**User B**	**UEB**	**IMSA**	**ASA**	**IBCFA**	**IBCFB**	**IMSB**	**ASB**		
1		→										User A calls User B
2			→		→						INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and
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
7					→						100 Trying	IMS_A responds with a 100 Trying provisional response
8						→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
9					←						100 Trying	IBCF_A responds with a 100 Trying provisional response
10							→				INVITE	**IBCF_A forwards INVITE to IBCF_B**
11							←				100 Trying	IBCF_B responds with a 100 Trying provisional response
12								→			**INVITE**	**IBCF_B forwards INVITE to IMS_B**
13								←			100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the ACR IFC in IMS_B
14									→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
15									←		100 Trying	AS optionally responds with a 100 Trying provisional response
16									←		433 Anonymity	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
17								←			**433 Anonymity**	**IMS_B forwards the 433 Anonymity Disallowed to IBCF_B**
18							←				433 Anonymity	**IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A**
19					←						433 Anonymity	**IBCF_A forwards the 433 Anonymity Disallowed to IMS_A**
20					→						**433 Anonymity**	**IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS**

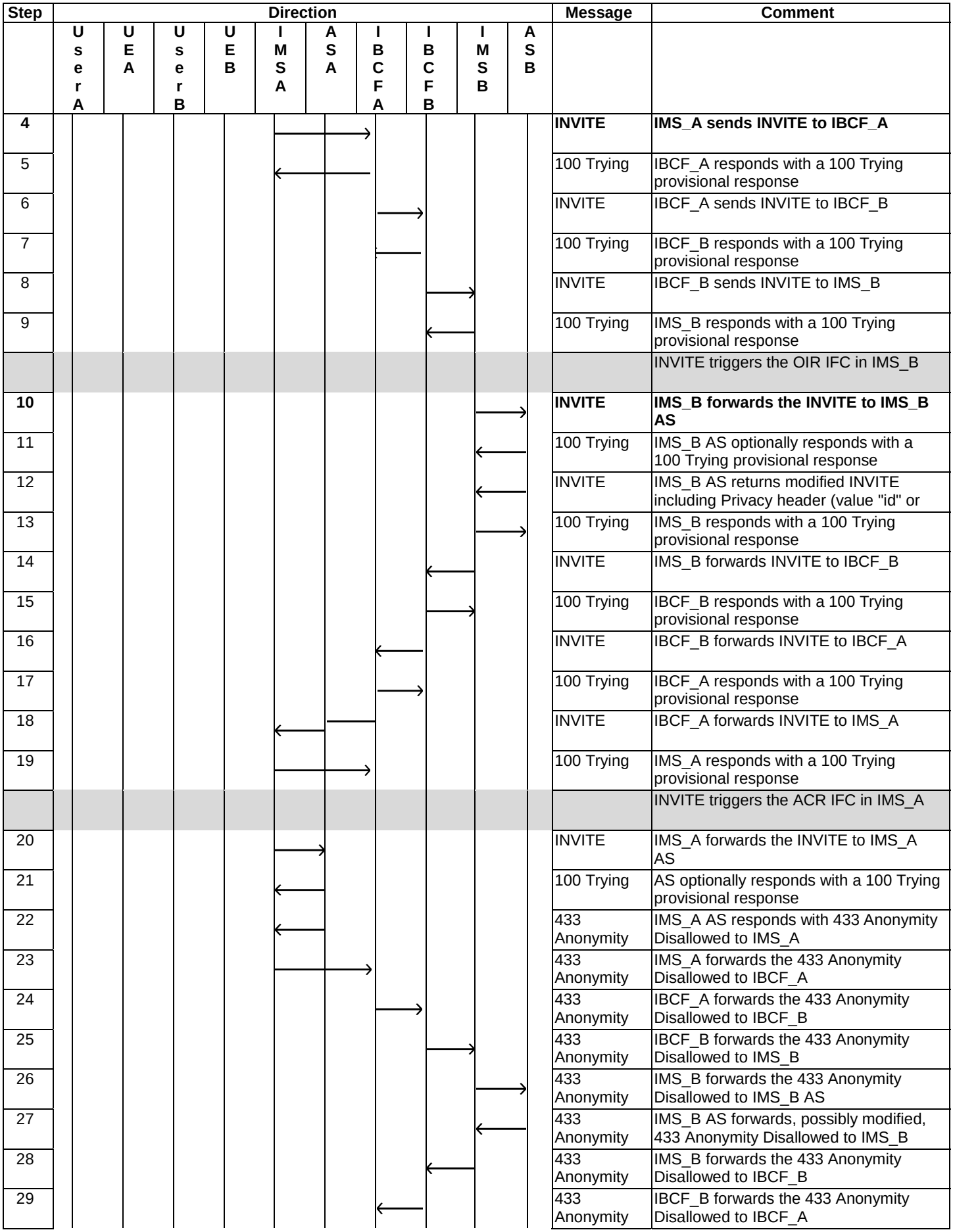
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
21					←						433 Anonymity	IMS_A AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_A
22		←									433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_A
23	←											User A is informed that the call has been rejected due to ACR
24		→									ACK	UE_A sends ACK to IMS_A
25					→						ACK	IMS_A forwards the ACK to IMS_A AS
26					←						ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
27					→						ACK	IMS_A forwards ACK to IBCF_A
28							→				ACK	IBCF_A forwards ACK to IBCF_B
29								→			ACK	IBCF_B forwards ACK to IMS_B
30									→		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 5.2.6.3.3 ¶1 (1st numbered list)
	TP_IMS_5067_01	TS 124 229 [1], clause 5.2.7.2 ¶5
	TP_IMS_5097_09	TS 124 229 [1], clause 5.4.3.2 ¶11 (items 5 and 8 in 1st numbered list)
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 6 (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-value_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 6 (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 10 (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 and* *including* access-network-charging-info) *}* *}*

Step	**Direction**										**Message**	**Comment**
	User A	**UEA**	**User B**	**UEB**	**IMSA**	**ASA**	**IBCFA**	**IBCFB**	**IMSB**	**ASB**		
1			→									User B calls User A
2				→							**INVITE**	**UE_B sends INVITE with the first SDP offer indicating all desired media and**
3				←							100 Trying	IMS_A responds with a 100 Trying provisional response



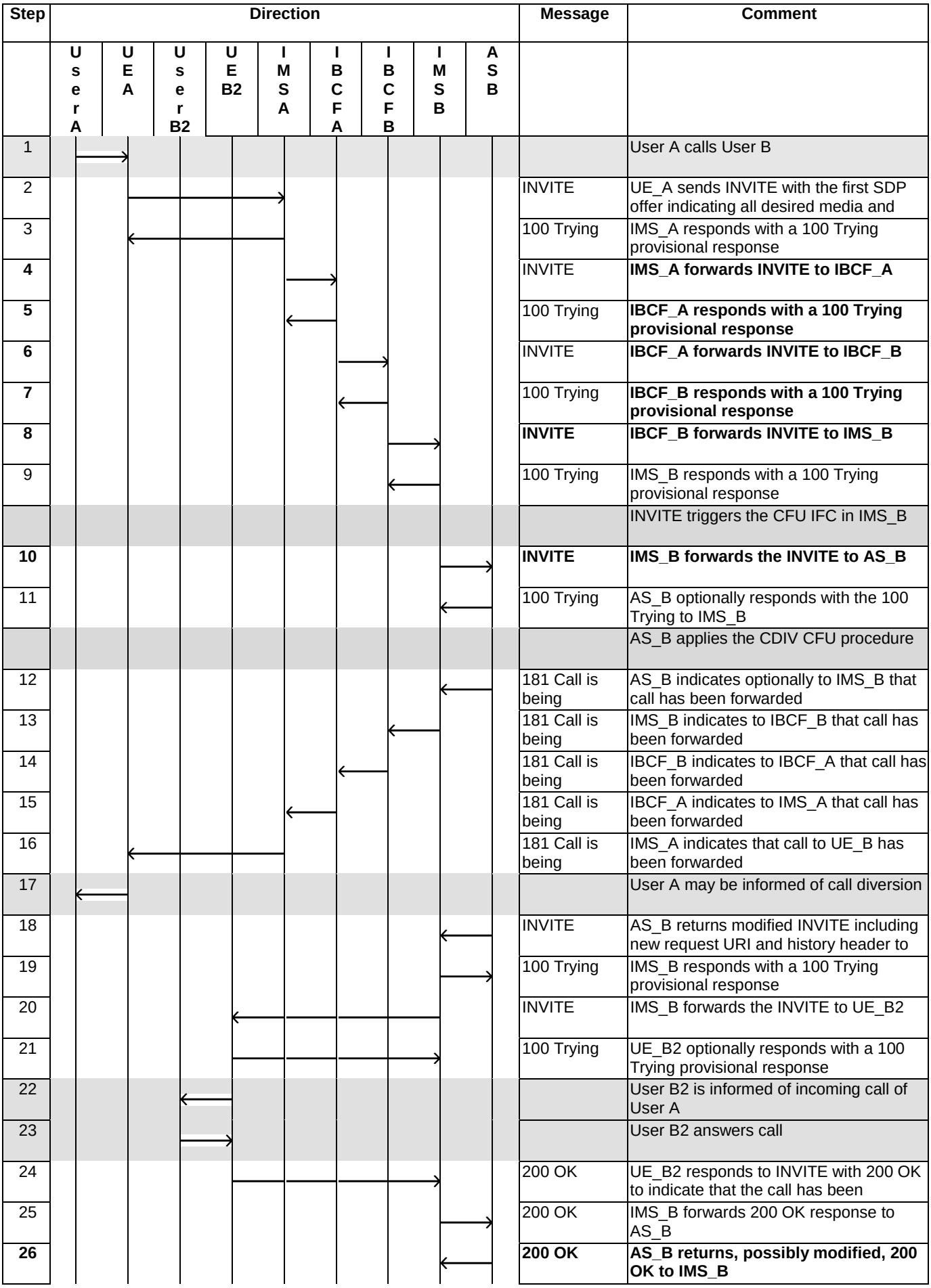
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
4											**INVITE**	**IMS_A sends INVITE to IBCF_A**
5											100 Trying	IBCF_A responds with a 100 Trying provisional response
6											INVITE	IBCF_A sends INVITE to IBCF_B
7											100 Trying	IBCF_B responds with a 100 Trying provisional response
8											INVITE	IBCF_B sends INVITE to IMS_B
9											100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the OIR 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 Privacy header (value "id" or
13											100 Trying	IMS_B responds with a 100 Trying provisional response
14											INVITE	IMS_B forwards INVITE to IBCF_B
15											100 Trying	IBCF_B responds with a 100 Trying provisional response
16											INVITE	IBCF_B forwards INVITE to IBCF_A
17											100 Trying	IBCF_A responds with a 100 Trying provisional response
18											INVITE	IBCF_A forwards INVITE to IMS_A
19											100 Trying	IMS_A responds with a 100 Trying provisional response
												INVITE triggers the ACR IFC in IMS_A
20											INVITE	IMS_A forwards the INVITE to IMS_A AS
21											100 Trying	AS optionally responds with a 100 Trying provisional response
22											433 Anonymity	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
23											433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to IBCF_A
24											433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IBCF_B
25											433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IMS_B
26											433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IMS_B AS
27											433 Anonymity	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
28											433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IBCF_B
29											433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
30					←						433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IMS_A
31				←							433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_B
32			←									User B is informed that the call has been rejected due to ACR
33				→							ACK	UE_B sends ACK to IMS_A
34					→						ACK	IMS_A sends ACK to IBCF_A
35							→				ACK	IBCF_A sends ACK to IBCF_B
36								→			ACK	IBCF_B sends ACK to IMS_B
37									→		ACK	IMS_B forwards the ACK to IMS_B AS
38									←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
39								←			ACK	IMS_B forwards ACK to IBCF_B
40							←				ACK	IBCF_B forwards ACK to IBCF_A
41					←						ACK	IBCF_A forwards ACK to IMS_A
42					→						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 ¶11 (1st numbered list)
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5115_08	TS 124 229 [1], clause 5.4.3.3 ¶89 (4th numbered list)
Use Case ref.:	UC_11_I	
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	

Interoperability Test Description		
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 6 (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-value_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 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 28 (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 / IBCF A / IBCF B / 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
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		INVITE	**IMS_A forwards INVITE to IBCF_A**
5		100 Trying	**IBCF_A responds with a 100 Trying provisional response**
6		INVITE	**IBCF_A forwards INVITE to IBCF_B**
7		100 Trying	**IBCF_B responds with a 100 Trying provisional response**
8		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the CFU IFC in IMS_B
10		**INVITE**	**IMS_B forwards the INVITE to AS_B**
11		100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
			AS_B applies the CDIV CFU procedure
12		181 Call is being	AS_B indicates optionally to IMS_B that call has been forwarded
13		181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
14		181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
15		181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
16		181 Call is being	IMS_A indicates that call to UE_B has been forwarded
17			User A may be informed of call diversion
18		INVITE	AS_B returns modified INVITE including new request URI and history header to
19		100 Trying	IMS_B responds with a 100 Trying provisional response
20		INVITE	IMS_B forwards the INVITE to UE_B2
21		100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
22			User B2 is informed of incoming call of User A
23			User B2 answers call
24		200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been
25		200 OK	IMS_B forwards 200 OK response to AS_B
26		**200 OK**	**AS_B returns, possibly modified, 200 OK to IMS_B**

Step	Direction									Message	Comment
	User A	UEA	User B2	UE B2	IMSA	IBCFA	IBCFB	IMSB	ASB		
27							←			**200 OK**	**IMS_B forwards 200 OK response to IBCF_B**
28						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
29					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
30		←								200 OK	IMS_A forwards 200 OK response to UE_A
31	←										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 5.2.6.3.3 ¶1 (1st numbered list)
	TP_IMS_5067_01	TS 124 229 [1], clause 5.2.7.2 ¶5
	TP_IMS_5070_01	TS 124 229 [1], clause 5.2.7.3 ¶3
	TP_IMS_5110_01	TS 124 229 [1], clause 5.4.3.3 ¶79 (after 6th dashed list)
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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5046_01 in CFW step 6 (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-value_parameter }* *}*
	2	TP_IMS_5067_01 in CFW step 6 (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_5070_01 in CFW step 13 (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 37 (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	IBCF A	IBCF B	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
3				←						100 Trying	IMS_A responds with a 100 Trying provisional response
4					→					INVITE	**IMS_A forwards INVITE to IBCF_A**
5					←					100 Trying	**IBCF_A responds with a 100 Trying provisional response**
6						→				INVITE	**IBCF_A forwards INVITE to IBCF_B**
7						←				100 Trying	**IBCF_B responds with a 100 Trying provisional response**
8							→			**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9							←			100 Trying	IMS_B responds with a 100 Trying provisional response
10							←			**INVITE**	**IMS_B forwards INVITE to IBCF_B**
11							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
12						←				**INVITE**	**IBCF_B forwards INVITE to IBCF_A**
13						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
14					←					**INVITE**	**IBCF_A forwards INVITE to IMS_A**
15					→					100 Trying	IMS_A responds with a 100 Trying provisional response
											INVITE triggers the CFU IFC in IMS_A
16					→	→	→	→	→	INVITE	IMS_A forwards the INVITE to IMS_A AS
17					←	←	←	←	←	100 Trying	IMS_A AS optionally responds with the 100 Trying to IMS_A
											IMS_A AS applies the CDIV CFU procedure
18					←	←	←	←	←	181 Call is being	IMS_A AS indicates optionally to IMS_A that call has been forwarded
19					→					181 Call is being	IMS_A indicates to IBCF_A that call has been forwarded
20						→				181 Call is being	IBCF_A indicates to IBCF_B that call has been forwarded
21							→			181 Call is being	IBCF_B indicates to IMS_B that call has been forwarded
22							←			181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
23						←				181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
24					←					181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
25				←						181 Call is being	IMS_A indicates to UE_B that call to UE_A has been forwarded
26			←								User B may be informed of call diversion

Step	Direction									Message	Comment
	User A2	UE A2	User B	UE B	IMS A	IBCF A	IBCF B	IMS B	AS A		
27					←					INVITE	IMS_A AS returns modified INVITE including new request URI and history
28									→	100 Trying	IMS_A responds with a 100 Trying provisional response
29		←								INVITE	IMS_A forwards the INVITE to UE_A2
30					→					100 Trying	UE_A2 optionally responds with a 100 Trying provisional response
31	←										User A2 is informed of incoming call of User B
32	→										User A2 answers call
33		→			→					200 OK	UE_A2 responds to INVITE with 200 OK to indicate that the call has been
34									→	200 OK	IMS_A forwards 200 OK response to IMS_A AS
35					←					**200 OK**	**IMS_A AS returns, possibly modified, 200 OK to IMS_A**
36					→					200 OK	**IMS_A forwards 200 OK response to IBCF_A**
37						→				200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
38							→			**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
39							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
40						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
41					←					200 OK	IBCF_A forwards 200 OK response to IMS_A
42				←						200 OK	IMS_A forwards 200 OK response to UE_B
43			←								User B is informed that call has been answered

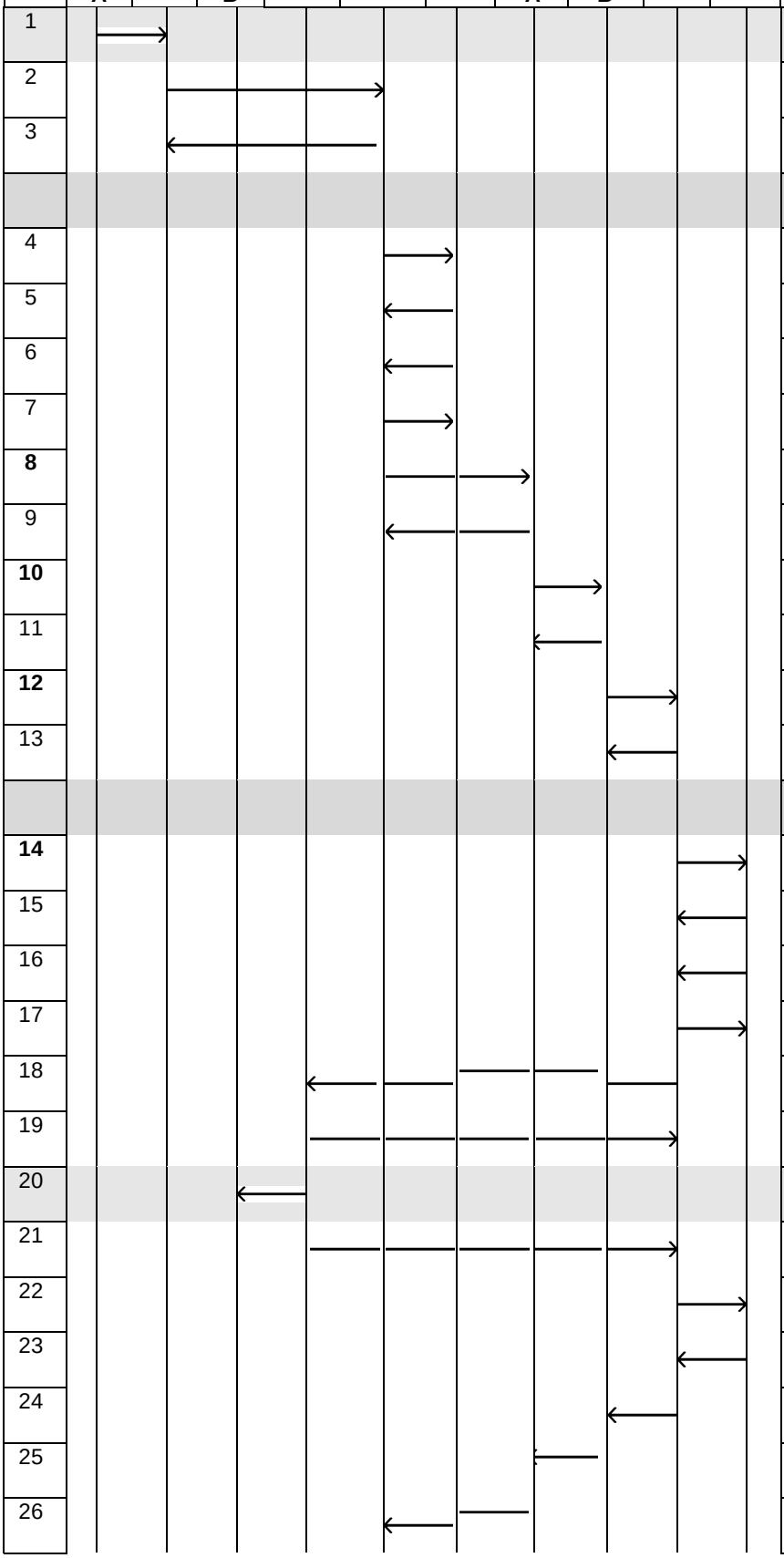
4.5.5.9 Supplementary Services OIP and OIR with AS

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 ¶11 (1st numbered list)
	TP_IMS_5108_03	TS 124 229 [1], clause 5.4.3.3 ¶5 (item 4 in 1st numbered list)
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

Conformance Criteria:	**Check**	
	1	TP_IMS_5097_01 in CFW step 10 (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-value_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 14 (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 / IBCF A / IBCF B / 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
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"
7		100 Trying	IMS_A responds with a 100 Trying provisional response
8		**INVITE**	**IMS_A forwards the INVITE to IBCF_A**
9		100 Trying	IBCF_A responds with a 100 Trying provisional response
10		**INVITE**	**IBCF_A forwards the INVITE to IBCF_B**
11		100 Trying	IBCF_B responds with a 100 Trying provisional response
12		**INVITE**	**IBCF_B forwards the INVITE to IMS_B**
13		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_B
14		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
15		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
16		INVITE	IMS_B AS returns modified INVITE including modified From and P-
17		100 Trying	IMS_B responds with a 100 Trying provisional response
18		INVITE	IMS_B forwards the INVITE to UE_B
19		100 Trying	UE_B optionally responds with a 100 Trying provisional response
20			User B is informed of incoming call of User A, user A's identity is not
21		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has
22		180 Ringing	IMS_B forwards the 180 Ringing to IMS_B AS
23		180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing to IMS_B
24		180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
25		180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
26		180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
27					→						180 Ringing	IMS_A forwards 180 Ringing response to IMS_A AS
28					←						180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing response to
29		←									180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
30	←											User A is informed that UE_B is ringing
31			→									User B answers call
32				→	→	→	→	→			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been
33									→		200 OK	IMS_B forwards the 200 OK to IMS_B AS
34									←		200 OK	IMS_B AS forwards, possibly modified, 200 OK to IMS_B
35								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
36							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
37					←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
38					→						200 OK	IMS_A forwards 200 OK response to IMS_A AS
39					←						200 OK	IMS_A AS forwards, possibly modified, 200 OK response to IMS_A
40		←									200 OK	IMS_A forwards the 200 OK response to UE_A
41	←											User A is informed that call has been answered

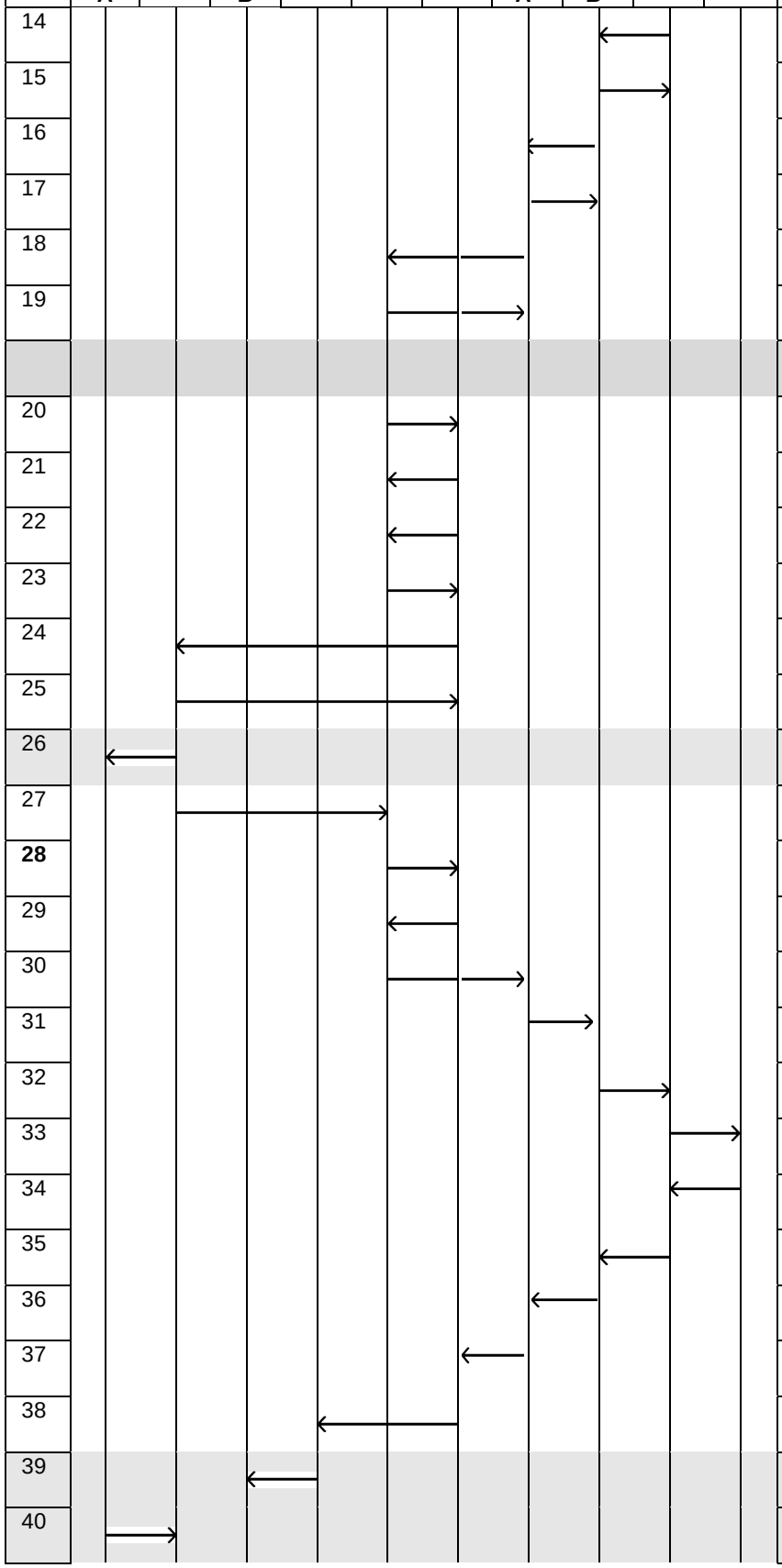
4.5.5.10 Supplementary Services OIP and OIR with AS in roaming

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 5.2.6.3.3 ¶1 (1st numbered list)
	TP_IMS_5097_09	TS 124 229 [1], clause 5.4.3.2 ¶11 (items 5 and 8 in 1st numbered list)
	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 ¶5
Use Case ref.:	UC_09_R	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B 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	
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 6 (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-value_parameter }* *}*
	2	TP_IMS_5097_09 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 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 and* *including* access-network-charging-info) *}* *}*

Interoperability Test Description		
	3	TP_IMS_5308_01 in CFW step 28 (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 42 (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* *including an access-network-charging-info_parameter* *}*
	4	TP_IMS_5067_01 in CFW step 6 (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**	**IBCF A**	**IBCF B**	**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
3				←							100 Trying	IMS_A responds with a 100 Trying provisional response
4					→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5					←						100 Trying	IBCF_A responds with a 100 Trying provisional response
6							→				**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
7							←				100 Trying	IBCF_B responds with a 100 Trying provisional response
8								→			**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9								←			100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the OIR 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 Privacy header (value "id" or
13									→		100 Trying	IMS_B responds with a 100 Trying provisional response



Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
14											INVITE	IMS_B forwards the INVITE to IBCF_B
15											100 Trying	IBCF_B responds with a 100 Trying provisional response
16											INVITE	IBCF_B forwards the INVITE to IBCF_A
17											100 Trying	IBCF_A responds with a 100 Trying provisional response
18											INVITE	IMS_B forwards the INVITE to IMS_A
19											100 Trying	IMS_A responds with a 100 Trying provisional response
												INVITE triggers the OIP IFC in IMS_A
20											INVITE	IMS_A forwards the INVITE to IMS_A AS
21											100 Trying	IMS A AS optionally responds with a 100 Trying provisional response
22											INVITE	IMS_A AS returns modified INVITE including modified From and P-
23											100 Trying	IMS_A responds with a 100 Trying provisional response
24											INVITE	IMS_A forwards the INVITE to UE_A
25											100 Trying	UE_A optionally responds with a 100 Trying provisional response
26												User A is informed of incoming call of User B, user B's identity is not
27											180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has
28											**180 Ringing**	**IMS_A forwards the 180 Ringing to IMS_A AS**
29											180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
30											180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
31											180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
32											180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
33											180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
34											180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
35											180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
36											180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
37											180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
38											180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
39												User B is informed that UE_A is ringing
40												User A answers call

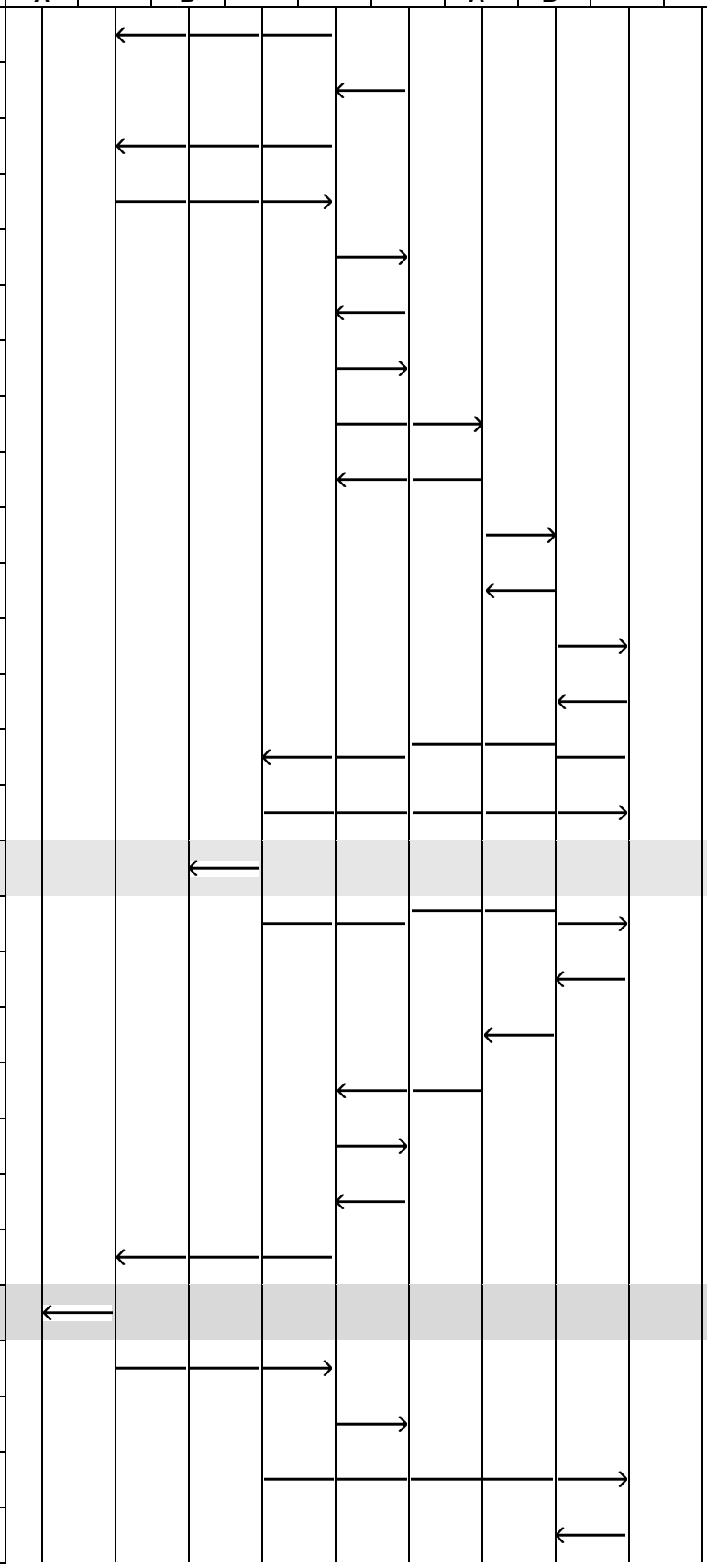
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
41											200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been
42											**200 OK**	**IMS_A forwards the 200 OK to IMS_A AS**
43											200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
44											200 OK	IMS_A forwards 200 OK response to IBCF_A
45											200 OK	IBCF_A forwards 200 OK response to IBCF_B
46											200 OK	IBCF_B 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, possibly modified, 200 OK response to IMS_B
49											200 OK	IMS_B forwards the 200 OK response to IBCF_B
50											200 OK	IBCF_B forwards the 200 OK response to IBCF_A
51											200 OK	IBCF_A forwards the 200 OK response to IMS_A
52											200 OK	IMS_A forwards the 200 OK response to UE_B
53												User B is informed that call has been answered

4.5.5.11 Ad-hoc Conference Call service

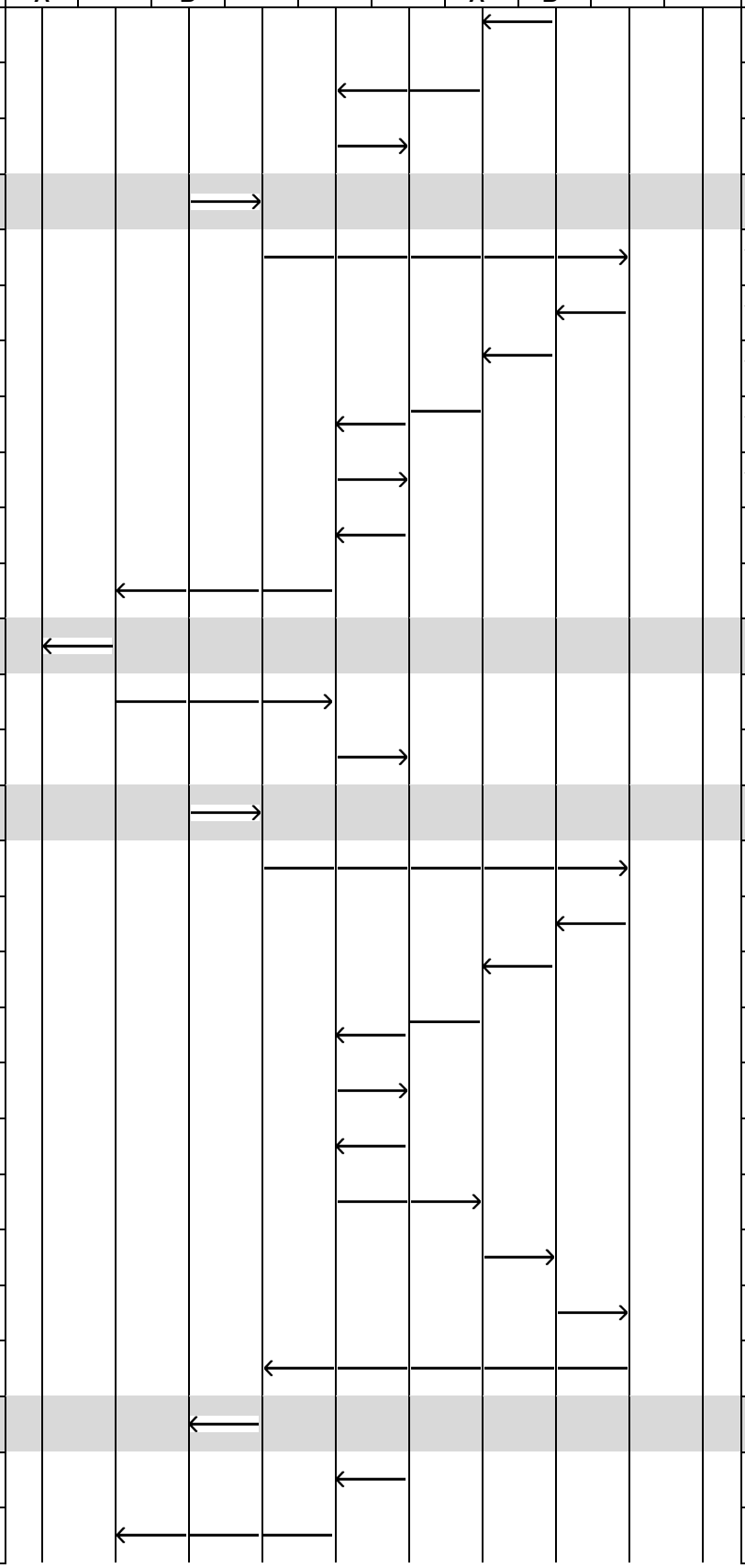
Interoperability Test Description		
Identifier:	TD_IMS_CONF_0001	
Summary:	IMS network handles subsequent INVITEs, UPDATEs, REFERs and NOTIFYs correctly during Ad-Hoc Conference calls	
Configuration:	CF_INT_CONF_CALL	
SUT	IMS_A	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (9th numbered list)
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	

Interoperability Test Description		
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
Conformance Criteria:	**Check**	
	1	TP_IMS_5121_02 in CFW in step 34 & 44 (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	IBCF A	IBCF B	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
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
14						→					REFER	IMS_A forwards the REFER to IMS_A AS
15					←	←					202 Accepted	IMS_A AS responds with a 202 Accepted



Step	Message	Comment
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
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
22	100 Trying	IMS_A responds with a 100 Trying provisional response
23	INVITE	IMS_A forwards the INVITE to IBCF_A
24	100 Trying	IBCF_A responds with a 100 Trying provisional response
25	INVITE	IBCF_A forwards the INVITE to IBCF_B
26	100 Trying	IBCF_B responds with a 100 Trying provisional response
27	INVITE	IBCF_B forwards the INVITE to IMS_B
28	100 Trying	IMS_B responds with a 100 Trying provisional response
29	INVITE	IMS_B forwards the INVITE to UE_B
30	100 Trying	UE_B responds with a 100 Trying provisional response
31		User B is informed of incoming invitation from User A to join the Conference Call
32	180 Ringing	UE_B sends a 180 ringing to IMS_B
33	180 Ringing	IMS_B forwards the 180 ringing to IBCF_B
34	180 Ringing	IBCF_B forwards the 180 ringing to IBCF_A
35	180 Ringing	IBCF_A forwards the 180 ringing to IMS_A
36	180 Ringing	IMS_A forwards the 180 ringing to IMS_A AS
37	NOTIFY	Upon reception of 180 Ringing from UE_B, IMS_A AS sends NOTIFY with
38	NOTIFY	IMS_A forwards the NOTIFY to UE_A
39		User A is notified that User B is being invited to join the call
40	200 OK	UE_A responds with 200 OK to IMS_A for NOTIFY
41	200 OK	IMS_A forwards the 200 OK response to IMS_A AS
42	**200 OK**	**UE_B responds with 200 OK to IMS_B for INVITE**
43	**200 OK**	**IMS B forwards the 200 OK response to IBCF_B**



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	IMS B	AS B		
44							←				200 OK	IBCF_B forwards the 200 OK response to IBCF_A
45					←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
46					→						200 OK	IMS A forwards the 200 OK response to IMS_A AS
47			→									User B joins the conference
48											ACK	UE_B acknowledges the 200 OK for INVITE
49								←			ACK	IMS B forwards the ACK to IBCF_B
50							←				ACK	IBCF_B forwards the ACK to IBCF_A
51					←						ACK	IBCF_A forwards the ACK to IMS_A
52					→						ACK	IMS A forwards the ACK to IMS_A AS
53					←						NOTIFY	AS_A sends NOTIFY to UE_A to inform it has successfully joined the conference
54		←									NOTIFY	IMS_A forwards NOTIFY to UE_A
55	←											User A is alerted that User B has joined the conference
56				→							200 OK	UE_A sends 200 OK response for NOTIFY
57					→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
58			→									User B leaves the conference
59									→		BYE	UE_B sends BYE to IMS_B to leave the conference
60								←			BYE	IMS_B forwards the BYE to IBCF_B
61							←				BYE	IBCF_B forwards the BYE to IBCF_A
62					←						BYE	IBCF_A forwards the BYE to IMS_A
63					→						BYE	IMS_A forwards the BYE to IMS_A AS
64					←						200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK
65						→					200 OK	IMS_A forwards the 200 OK response to IBCF_A
66								→			200 OK	IBCF_A forwards the 200 OK response to IBCF_B
67									→		200 OK	IBCF_B forwards the 200 OK response to IMS_B
68				←							200 OK	IMS_B forwards the 200 OK response to UE_B
69			←									User B is informed that the conference has ended
70					←						NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the
71		←									NOTIFY	IMS_A forwards NOTIFY to UE_A

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	IMSB	ASB		
72	←											User A is notified that user B has left the conference
73			→	→	→						200 OK	UE_A sends a 200 OK response for NOTIFY
74						→					200 OK	IMS_A forwards the 200 OK response to IMS_A AS

4.5.6 Presence

The test descriptions for the presence service are defined in TS 102 901 [17].

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 F ¶15 (before NOTE 3)
	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	
Test Sequence:	**Step**	
	29	Verify that user A 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 or* *tls-pending or* *tls-yes or* *ip-assoc-pending or* *ip-assoc-yes)}* *then { IMS_A sends a third party register to AS_A* *containing a P-Access-Network-Info header* *containing a P-Visited-Network-ID header* *}* *}*

Interoperability Test Description		
	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
	User A	**UEA**	**User B**	**UEB**	**IMSA**	**ASA**	**IMSB**	**ASB**		
										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 containing 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_14	TS 124 229 [1], clause 5.4.3.2 ¶11 (items 5 and 8 in 1st numbered list)
	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	
Test Sequence:	**Step**	
	31	Verify that user A receives service attachment information

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_14 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* *(including a orig-ioi_parameter indicating IMS_A and* *not including a term-ioi_parameter and* *including* access-network-charging-info*)}* *}*
	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 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
Use Case ref.:	UC_19	
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	Verify that user A receives the broadcast content
	12	User A terminates the session
	19	Verify that 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* *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 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
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	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A initiates a CoD session (content selection)
	26	Verify that user A starts receiving the streaming content
	27	User A terminates the session
	36	Verify that 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* *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
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

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
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 ¶5 (item 4 in 1st numbered list)
	TP_IMS_5107_02	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 8th numbered list)
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	Verify that user A starts receiving the streaming content

Interoperability Test Description		
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* *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 ¶5 (item 4 in 1st numbered list)
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	Verify that 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 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 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

4.5.8 IMS-PSTN Interoperability

4.5.8.1 IMS-to-PSTN call

4.5.8.1.1 Normal Call, PSTN user clears call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0001	
Summary:	Outgoing call to PSTN, PSTN user clears call	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_02	TS 124 229 [1], clause 5.5.3.1.2
	TP_IMS_MGCF_03	TS 124 229 [1], clause 5.5.3.1.2
	TP_IMS_MGCF_06	TS 124 229 [1], clause 5.5.3.2.2 TS 129 163 [18], clause 7.2.3.1.4
	TP_IMS_MGCF_07	TS 124 229 [1], clause 5.4.1.2.2 TS 129 163 [18], clause 7.2.3.1.5
	TP_IMS_MGCF_08	TS 124 229 [1], clause 5.5.4.1 TS 129 163 [18], clause 7.2.3.1.8
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	
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 A and B can communicate
	7	User B 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_MGCF_02 in CFW step 5 (100 Trying): *ensure that {* *when { IUT receives an initial INVITE from IAM_A}* *then { IUT sends a 100_response to IMS_A* *}* *}*
	2	TP_IMS_MGCF_03 in CFW step 5 and 6 (183 Session Progress): *ensure that {* *when { IUT receives an initial INVITE from IMS_A }* *then { IUT sends a 100_response to IMS_A and* *sends 183_response to IMS_A* *containing Require_header indicating 100rel_value and* *containing a P-Charging-Vector_header* *including a term-ioi_parameter* *indicating the operator_identifier of IMS_A* *}* *}*
	3	TP_IMS_MGCF_06 in CFW step 15 (180 Ringing): *ensure that {* *when { IUT receives an ACM indicating subscriber_free* *or receives a CPG indicating ALERTING from PSTN }* *then { IUT sends a 180_response to IMS_A* *}* *}*

Interoperability Test Description		
	4	TP_IMS_MGCF_07 in CFW step 20 (200 OK): *ensure that {* *when { IUT receives an ANM from PSTN}* *then { IUT sends a 200_response to IMS_A* *}* *}*
	5	TP_IMS_MGCF_08 in CFW step 30B (BYE): *ensure that {* *when { IUT receives an REL from PSTN}* *then { IUT sends a BYE to IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	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
3		←					100 Trying	IMS_A responds with a 100 Trying provisional response
4			→				INVITE	IMS_A forwards INVITE to MGCF
5			←				100 Trying	MGCF responds with a 100 Trying provisional response
6			←				183 Session Progress	MGCF responds with 183 Session Progress response
7		←					183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
8		→					PRACK	UE_A sends PRACK to IMS_A
9			→				PRACK	IMS_A forwards PRACK to MGCF
10			←				200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
11		←					200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
12				→			IAM	MGCF sends IAM to PSTN
13					→			User B is informed of incoming call of User A
14				←			ACM/CPG	PSTN responds with ACM/CPG
15			←				180 Ringing	MGCF sends 180 Ringing response to IMS_A
16		←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
17	←							User A is informed that UE_B is ringing
18					←			User B answers call
19				←			ANM	PSTN sends ANM to MGCF
20			←				200 OK	MGCF sends 200 OK response to IMS_A
21		←					200 OK	IMS_A forwards 200 OK response to UE_A

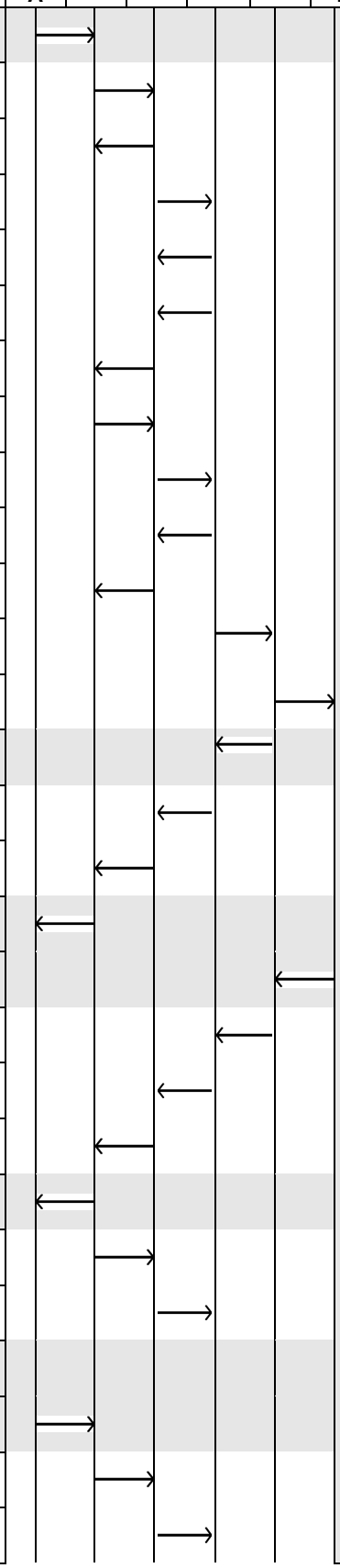
Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
22	←							User A is informed that call has been answered
23		→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
24			→				ACK	IMS_A forwards ACK to MGCF
25								User A and B can communicate
26B					←			User B ends call
27B				←			REL	PSTN sends BYE to MGCF
28B				→			RLC	MGCF responds RLC to PSTN
29B					→			User B is informed that call has ended
30B			←				BYE	MGCF sends 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 MGCF

4.5.8.1.2 Normal Call, IMS user clears call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0002	
Summary:	Outgoing call to PSTN, IMS user clears call	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_02	TS 124 229 [1], clause 5.5.3.1.2
	TP_IMS_MGCF_03	TS 124 229 [1], clause 5.5.3.1.2
	TP_IMS_MGCF_06	TS 124 229 [1], clause 5.5.3.2.2 TS 129 163 [18], clause 7.2.3.1.4
	TP_IMS_MGCF_07	TS 124 229 [1], clause 5.4.1.2.2 TS 129 163 [18], clause 7.2.3.1.5
	TP_IMS_MGCF_17	TS 129 163 [18], clause 7.2.3.2.13
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user A and B can communicate
	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_MGCF_02 in CFW step 5 (100 Trying): *ensure that {* *when { IUT receives an initial INVITE from IAM_A}* *then { IUT sends a 100_response to IMS_A* *}* *}*
	2	TP_IMS_MGCF_03 in CFW step 5 and 6 (183 Session Progress): *ensure that {* *when { IUT receives an initial INVITE from IMS_A }* *then { IUT sends a 100_response to IMS_A and* *sends 183_response to IMS_A* *containing Require_header indicating 100rel_value and* *containing a P-Charging-Vector_header* *including a term-ioi_parameter* *indicating the operator_identifier of IMS_A* *}* *}*
	3	TP_IMS_MGCF_06 in CFW step 15 (180 Ringing): *ensure that {* *when { IUT receives an ACM indicating subscriber_free* *or receives a CPG indicating ALERTING from PSTN }* *then { IUT sends a 180_response to IMS_A* *}* *}*
	4	TP_IMS_MGCF_07 in CFW step 20 (200 OK): *ensure that {* *when { IUT receives an ANM from PSTN}* *then { IUT sends a 200_response to IMS_A* *}* *}*

	5	TP_IMS_MGCF_29A in CFW step 24 (REL):
		ensure that {
		when { IUT receives a BYE from IMS_A }
		then { IUT sends an REL to PSTN
		}
		}



Step	Direction	Message	Comment
	User A / UEA / IMSA / MGCF / PSTN / 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
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		INVITE	IMS_A forwards INVITE to MGCF
5		100 Trying	MGCF responds with a 100 Trying provisional response
6		183 Session Progress	MGCF responds with 183 Session Progress response
7		183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
8		PRACK	UE_A sends PRACK to IMS_A
9		PRACK	IMS_A forwards PRACK to MGCF
10		200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
11		200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
12		IAM	MGCF sends IAM to PSTN
13			User B is informed of incoming call of User A
14		ACM/CPG	PSTN responds with ACM/CPG
15		180 Ringing	MGCF sends 180 Ringing response to IMS_A
16		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
17			User A is informed that UE_B is ringing
18			User B answers call
19		ANM	PSTN sends ANM to MGCF
20		200 OK	MGCF sends 200 OK response to IMS_A
21		200 OK	IMS_A forwards 200 OK response to UE_A
22			User A is informed that call has been answered
23		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
24		ACK	IMS_A forwards ACK to MGCF
25			User A and B can communicate
26A			User A ends call
27A		BYE	UE_A sends BYE
28A		BYE	IMS_A forwards BYE to MGCF

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
29A				→			REL	MGCF sends REL to PSTN
30A					→			User B is informed that call has ended
31A				←			RLC	PSTN sends RLC response to MGCF
32A			←				200 OK	MGCF sends 200 OK response to IMS_A
33A		←					200 OK	IMS_A forwards the 200 OK response to UE_A
34A	←							User A is informed that call has ended

4.5.8.1.3 Unsuccessful Call, PSTN user busy

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0003	
Summary:	Outgoing call to PSTN, user B busy	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_02	TS 124 229 [1], clause 5.5.3.1.2
	TP_IMS_MGCF_09	TS 129 163 [18], clause 7.2.3.1.8
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A • User B in the PSTN is busy	
Test Sequence:	**Step**	
	1	User A calls User B
	2	Verify that user A is informed that User B is busy
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_02 in CFW step 6 (100 Trying): *ensure that {* *when { IUT receives an initial INVITE from IAM_A}* *then { IUT sends a 100_response to IMS_A* *}*
	2	TP_IMS_MGCF_09 in CFW step 14 (486 Busy Here): *ensure that {* *when { IUT receives an REL with cause17 from PSTN}* *then { IUT sends a 486_response to IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
1								User B is busy
2	→							User A calls User B
3		→					INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that
4		←					100 Trying	IMS_A responds with a 100 Trying provisional response
5			→				INVITE	IMS_A forwards INVITE to MGCF
6			←				100 Trying	MGCF responds with a 100 Trying provisional response
7			←				183 Session Progress	MGCF responds with 183 Session Progress response
8		←					183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
9		→					PRACK	UE_A sends PRACK to IMS_A
10			→				PRACK	IMS_A forwards PRACK to MGCF
11			←				200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
12		←					200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
13				→			IAM	MGCF sends IAM to PSTN
14				←			REL (cause #17)	PSTN responds with REL "user busy"
15				→			RLC	PSTN sends RLC to MGCF
16			←				486 Busy Here	MGCF sends 486 Busy Here response to IMS_A
17		←					486 Busy Here	IMS_A forwards 486 Busy Here response to UE_A
18	←							User A is informed that User B is busy
19		→					ACK	UE_A acknowledges the receipt of 486 for INVITE
20			→				ACK	IMS_A forwards ACK to MGCF

4.5.8.1.4 IMS user holds/resumes call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0004	
Summary:	Outgoing call to PSTN, communication hold by IMS user	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_11	TS 129 163 [18], clause 7.4.10.1
	TP_IMS_MGCF_12	TS 129 163 [18], clause 7.4.10.1
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A • UE_A configured to perform user initiated hold/resume using INVITE	
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 A and B can communicate
	7	User A puts connection to B on hold
	8	Verify that user A and B cannot communicate
	9	User A resumes connection to B
	10	Verify that user A and B can communicate
	11	User B ends call
	12	Verify that user B is informed that call has ended
	13	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_11 in CFW step 31 (CPG): *ensure that {* *when { IUT receives an UPDATE or a target_refresh INVITE containing a SDP indicating sendonly from IMS_A }* *then { IUT sends a CPG indicating remote_hold to PSTN }* *}*
	2	TP_IMS_MGCF_12 in CFW step 37 (CPG): *ensure that {* *when { IUT receives an UPDATE or a target_refresh INVITE containing a SDP indicating sendrecv from IMS_A }* *then { IUT sends a CPG indicating remote_retrieve to PSTN }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
25								User A and B can communicate
26								User A sets B on hold
27		→					UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendonly) to IMS_A
28			→				UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to MGCF
29			←				200 OK (UPDATE/INVITE)	MGCF replies 200 OK to IMS_A
30		←					200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to UE_A
31				→			CPG	MGCF sends CPG "remote HOLD"
32								User A and B cannot communicate
33		→					UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendrecv) to IMS_A
34			→				UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to MGCF
35			←				200 OK (UPDATE/INVITE)	MGCF replies 200 OK to IMS_A
36		←					200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to UE_A
37				→			CPG	MGCF sends CPG "remote RETRIEVE"
38								User A and B can communicate
39					←			User B ends call
40								Continue UC_20 (26B to 34B)

4.5.8.1.5 PSTN user holds/resumes call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_005	
Summary:	Outgoing call to PSTN, communication hold by PSTN user	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_13	TS 129 163 [18], clause 7.4.10.2
	TP_IMS_MGCF_14	TS 129 163 [18], clause 7.4.10.2
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	
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 A and B can communicate
	7	User B puts connection to A on hold
	8	Verify that user A and B cannot communicate
	9	User B resumes connection to A
	10	Verify that user A and B can communicate
	11	User B ends call
	12	Verify that user B is informed that call has ended
	13	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_13 in CFW step 28 (UPDATE): *ensure that {* *when { IUT receives a CPG indicating remote_hold from PSTN }* *then { IUT sends an UPDATE or a target_refresh INVITE* *containing a SDP* *indicating sendonly to IMS_A* *}* *}*
	2	TP_IMS_MGCF_14 in CFW step 37 (UPDATE):: *ensure that {* *when { IUT receives a CPG indicating remote_retrieve from PSTN }* *then { IUT sends an UPDATE or a target_refresh INVITE* *containing a SDP* *indicating sendonly to IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
								Follow UC_21 (1 to 24)
25								User A and B can communicate
26								User B sets A on hold
27				←			CPG	MGCF receives CPG with remote HOLD
28			←				UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendonly) to IMS_A
29		←					UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to UE_A
30		→					200 OK (UPDATE/INVITE)	UE_A replies 200 OK to IMS_A
31			→				200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to MGCF
32								User A and B cannot communicate
33				←			CPG	MGCF receives CPG with remote RETRIEVE
34			←				UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendrecv) to IMS_A
35		←					UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to UE_A
36		→					200 OK (UPDATE/INVITE)	UE_A replies 200 OK to IMS_A
37			→				200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to MGCF
38								User A and B can communicate
39					←			User A ends call
								Continue UC_21 (26A to 34A)

4.5.8.2 PSTN-to-IMS call

4.5.8.2.1 Normal Call, PSTN user clears call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0006	
Summary:	Incoming call from PSTN, PSTN user clears call	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_01	TS 124 229 [1], clause 5.5.3.1.1
	TP_IMS_MGCF_05	TS 124 229 [1], clause 5.5.3.2,1
	TP_IMS_MGCF_15	TS 129 163 [18], clauses 7.2.3.2.4 and 7.2.3.2.6
	TP_IMS_MGCF_16	TS 129 163 [18], clause 7.2.3.2.8
	TP_IMS_MGCF_08	TS 124 229 [1], clause 5.5.4.1 TS 129 163 [18], clause 7.2.3.1.8
Use Case ref.:	UC_21	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A is configured according to table 1 • UE_A has IP bearers established to its IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	
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 the call
	5	Verify that user A and B can communicate
	6	User B ends call
	7	Verify that user B is informed that call has ended
	8	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_01 in CFW step 3 (INVITE): *ensure that {* *when { IUT receives an initial IAM from PSTN }* *then { IUT sends a INVITE to IMS_A* *containing a Request_URI* *indicating Tel_URI_E.164_Number* *or (Sip_URI_E.164_Number with user_portion_phone)* *containing a Contact_header* *indicating anyvalue_GRUU_format and* *containing a Supported_header* *including an 100rel_value and* *containing a P-Asserted-Identity_header and* *containing a P-Charging-Vector_header* *indicating an icid-value_parameter and* *containing a SDP* *indicating codec_supported and curr_precondition* *}* *}*
	2	TP_IMS_MGCF_05 in CFW step 14 (UPDATE): *ensure that {* *when { IUT receives an 200OK_PRACK from IMS_A and conditions_fullfilled}* *then { IUT sends a UPDATE to IMS_A* *}* *}*
	3	TP_IMS_MGCF_15 in CFW step 20 (ACM/CPG): *ensure that {* *when { IUT receives a 180_response from IMS_A }* *then { IUT sends an ACM indicating subscriber_free* *or sends a CPG indicating ALERTING to PSTN* *}* *}*
	4	TP_IMS_MGCF_16 in CFW step 25 (ANM): *ensure that {* *when { IUT receives a 200_response from IMS_A }* *then { IUT sends an ANM to PSTN* *}* *}*
	5	TP_IMS_MGCF_08 in CFW step 33B (BYE): *ensure that {* *when { IUT receives an REL from PSTN}* *then { IUT sends a BYE to IMS_A* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
1					←			User B calls User A
2				←			IAM	PSTN send IAM to MGCF
3			←				INVITE	MGCF sends INVITE to IMS_A (SDP with precondition status, MIME subtype
4			→				100 Trying	IMS_A responds with a 100 Trying provisional response
5		←					INVITE	IMS_A forwards INVITE to UE_A
6		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
7		→					183 Session Progress	UE_A sends 183 Session Progress response to IMS_A
8			→				183 Session Progress	IMS_A forwards 183 Session Progress response to MGCF
9			←				PRACK	MGCF responds with PRACK to IMS_A
10		←					PRACK	IMS_A forwards PRACK to UE_A
11		→					200 OK (PRACK)	UE_A responds with 200 OK to IMS_A
12			→				200 OK (PRACK)	IMS_A forwards 200 OK to MGCF
13			←				UPDATE	MGCF sends UPDATE to IMS_A
14		←					UPDATE	IMS_A forwards UPDATE to UE_A
15		→					200 OK (UPDATE)	UE_A responds with 200 OK to IMS_A
16			→				200 OK (UPDATE)	IMS_A forwards 200 OK to MGCF
17	←							User A is informed of incoming call of User B
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 180 Ringing response to MGCF
20				→			ACM/CPG	MGCF send ACM/CPG to PSTN
21					→			User B is informed that UE_A is ringing
22	→							User A answers the call
23		→					200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
24			→				200 OK	IMS_A forwards 200 OK response to MGCF
25				→			ANM	MGCF sends ANM to PSTN
26			←				ACK	MGCF sends ACK to PSTN
27		←					ACK	IMS_A forwards ACK to UE_A
28	←							User A and B can communicate

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
29B					←			User B ends call
30B				←			REL	PSTN sends REL to MGCF
31B				→			RLC	MGCF sends RLC to PSTN
32B					→			User B is informed that call has ended
33B			←				BYE	MGCF sends 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 MGCF

4.5.8.2.2 Normal Call, IMS user clears call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0007	
Summary:	Incoming call from PSTN, IMS user clears call	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_01	TS 124 229 [1], clause 5.5.3.1.1
	TP_IMS_MGCF_05	TS 124 229 [1], clause 5.5.3.2,1
	TP_IMS_MGCF_15	TS 129 163 [18], clauses 7.2.3.2.4 and 7.2.3.2.6
	TP_IMS_MGCF_16	TS 129 163 [18], clause 7.2.3.2.8
	TP_IMS_MGCF_17	TS 129 163 [18], clause 7.2.3.2.13
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	
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 the call
	5	Verify that user A and B can communicate
	6	User A ends call
	7	Verify that user B is informed that call has ended
	8	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_01 in CFW step 3 (INVITE): *ensure that {* *when { IUT receives an initial IAM from PSTN }* *then { IUT sends a INVITE to IMS_A* *containing a Request_URI* *indicating Tel_URI_E.164_Number* *or (Sip_URI_E.164_Number with user_portion_phone)* *containing a Contact_header* *indicating anyvalue_GRUU_format and* *containing a Supported_header* *including an 100rel_value and* *containing a P-Asserted-Identity_header and* *containing a P-Charging-Vector_header* *indicating an icid-value_parameter and* *containing a SDP* *indicating codec_supported and curr_precondition* *}* *}*
	2	TP_IMS_MGCF_05 in CFW step 14 (UPDATE): *ensure that {* *when { IUT receives an 200OK_PRACK from IMS_A and conditions_fullfilled}* *then { IUT sends a UPDATE to IMS_A* *}* *}*
	3	TP_IMS_MGCF_15 in CFW step 20 (ACM/CPG): *ensure that {* *when { IUT receives a 180_response from IMS_A }* *then { IUT sends an ACM indicating subscriber_free* *or sends a CPG indicating ALERTING to PSTN* *}* *}*
	4	TP_IMS_MGCF_16 in CFW step 25 (ANM): *ensure that {* *when { IUT receives a 200_response from IMS_A }* *then { IUT sends an ANM to PSTN* *}* *}*
	5	TP_IMS_MGCF_32A in CFW step 24 (REL): *ensure that {* *when { IUT receives a BYE from IMS_A }* *then { IUT sends an REL to PSTN* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
1					←			User B calls User A
2				←			IAM	PSTN send IAM to MGCF
3			←				INVITE	MGCF sends INVITE to IMS_A (SDP with precondition status, MIME subtype
4			→				100 Trying	IMS_A responds with a 100 Trying provisional response
5		←					INVITE	IMS_A forwards INVITE to UE_A
6		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
7		→					183 Session Progress	UE_A sends 183 Session Progress response to IMS_A
8			→				183 Session Progress	IMS_A forwards 183 Session Progress response to MGCF
9			←				PRACK	MGCF responds with PRACK to IMS_A
10		←					PRACK	IMS_A forwards PRACK to UE_A
11		→					200 OK (PRACK)	UE_A responds with 200 OK to IMS_A
12			→				200 OK (PRACK)	IMS_A forwards 200 OK to MGCF
13			←				UPDATE	MGCF sends UPDATE to IMS_A
14		←					UPDATE	IMS_A forwards UPDATE to UE_A
15		→					200 OK (UPDATE)	UE_A responds with 200 OK to IMS_A
16			→				200 OK (UPDATE)	IMS_A forwards 200 OK to MGCF
17	←							User A is informed of incoming call of User B
18		→					180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has
19			→				180 Ringing	IMS_A forwards 180 Ringing response to MGCF
20				→			ACM/CPG	MGCF send ACM/CPG to PSTN
21					→			User B is informed that UE_A is ringing
22	→							User A answers the call
23		→					200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been
24			→				200 OK	IMS_A forwards 200 OK response to MGCF
25				→			ANM	MGCF sends ANM to PSTN
26			←				ACK	MGCF sends ACK to PSTN
27		←					ACK	IMS_A forwards ACK to UE_A
28	←							User A and B can communicate

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
29A	→							User A ends call
30A		→					BYE	UE_A releases the call with BYE
31A			→				BYE	IMS_A forwards BYE to MGCF
32A				→			REL	MGCF sends REL to PSTN
33A				←			RLC	PSTN sends response RLC to MGCF
34A					→			User B is informed that call has ended
35A			←				200 OK	MGCF sends 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

4.5.8.2.3 Unsuccessful Call, IMS user busy

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_008	
Summary:	Incoming call from PSTN, user A busy	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_01	TS 124 229 [1], clause 5.5.3.1.1
	TP_IMS_MGCF_10	TS 129 163 [18], clause 7.2.3.2.12
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A • User A in IMS is busy	
Test Sequence:	**Step**	
	1	User B calls User A
	2	Verify that user B is informed that UE_A is busy

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_01 in CFW step 3 (INVITE): *ensure that {* *when { IUT receives an initial IAM from PSTN }* *then { IUT sends a INVITE to IMS_A* *containing a Request_URI* *indicating Tel_URI_E.164_Number* *or (Sip_URI_E.164_Number with user_portion_phone)* *containing a Contact_header* *indicating anyvalue_GRUU_format and* *containing a Supported_header* *including an 100rel_value and* *containing a P-Asserted-Identity_header and* *containing a P-Charging-Vector_header* *indicating an icid-value_parameter and* *containing a SDP* *indicating codec_supported and curr_precondition* *}* *}*
	2	TP_IMS_MGCF_10 in CFW step 11 (REL): *ensure that {* *when { IUT receives a 486_response from IMS_A}* *then { IUT sends a REL with (cause17 or cause34) to PSTN* *}* *}*

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
1					←			User B calls User A
2				←			IAM	PSTN send IAM to MGCF
3			←				INVITE	MGCF sends INVITE to IMS_A (SDP with precondition status, MIME subtype
4			→				100 Trying	IMS_A responds with a 100 Trying provisional response
5		←					INVITE	IMS_A forwards INVITE to UE_A
6		→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
7		→					486 Busy Here	UE_A responds to initial INVITE with 486 Busy Here to indicate that UE_A is busy
8			→				486 Busy Here	IMS_A forwards 486 Busy Here response to MGCF
9			←				ACK	MGCF sends ACK to IMS_A
10		←					ACK	IMS_A forwards ACK to UE_A
11				→			REL (cause #17)	MGCF send REL (user busy)
12				←			RLC	MGCF receives RLC
13					→			User B is informed that UE_A is busy

4.5.8.2.4 IMS user holds/resumes call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0009	
Summary:	Incoming call from PSTN, communication hold by IMS user	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_11	TS 129 163 [18], clause 7.4.10.1
	TP_IMS_MGCF_12	TS 129 163 [18], clause 7.4.10.1
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A • UE_A configured to perform user initiated hold/resume using INVITE	
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 uUser B is informed that UE_A is ringing
	4	User A answers the call
	5	Verify that user A and B can communicate
	6	User A puts connection to B on hold
	7	Verify that user A and B cannot communicate
	8	User A resumes connection to B
	9	Verify that user A and B can communicate
	10	User A ends call
	11	Verify that user B is informed that call has ended
	12	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_11 in CFW step 34 (CPG): *ensure that {* *when { IUT receives an UPDATE or a target_refresh INVITE containing a SDP indicating sendonly from IMS_A }* *then { IUT sends a CPG indicating remote_hold to PSTN }* *}*
	2	TP_IMS_MGCF_12 in CFW step 40 (CPG): *ensure that {* *when { IUT receives an UPDATE or a target_refresh INVITE containing a SDP indicating sendrecv from IMS_A }* *then { IUT sends a CPG indicating remote_retrieve to PSTN }* *}*

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
								Follow UC_21 (1 to 27)
28								User A and B can communicate
29								User A sets B on hold
30			→				UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendonly) to IMS_A
31				→			UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to MGCF
32				←			200 OK	MGCF replies 200 OK to IMS_A
33			←				200 OK	IMS_A forwards 200 OK to UE_A
34					→		CPG	MGCF sends CPG with remote HOLD
35								User A and B cannot communicate
36			→				UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendrecv) to IMS_A
37				→			UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to MGCF
38				←			200 OK	MGCF replies 200 OK to IMS_A
39			←				200 OK	IMS_A forwards 200 OK to UE_A
40					→		CPG	MGCF sends CPG with remote RETRIEVE
41								User A and B can communicate
42					←			User A ends call
43								Continue UC_21 (29A to 37A)

4.5.8.2.5 PSTN user holds/resumes call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0010	
Summary:	Incoming call from PSTN, communication hold by PSTN user	
Configuration:	CF_PSTN	
SUT	IMS_A and MGCF	
References	**Test Purpose**	**Specification Reference**
	TP_IMS_MGCF_13	TS 129 163 [18], clause 7.4.10.2
	TP_IMS_MGCF_14	TS 129 163 [18], clause 7.4.10.2
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 IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • MGCF within the trust domain of IMS_A	
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 the call
	5	Verify that user A and B can communicate
	6	User B puts connection to A on hold
	7	Verify that user A and B cannot communicate
	8	User B resumes connection to A
	9	Verify that user A and B can communicate
	10	User A ends call
	11	Verify that user B is informed that call has ended
	12	Verify that user A is informed that call has ended

Interoperability Test Description		
Conformance Criteria:	**Check**	

	1	TP_IMS_MGCF_13 in CFW step 30 (UPDATE):
		ensure that {
		when { IUT receives a CPG indicating remote_hold from PSTN }
		then { IUT sends an UPDATE or a target_refresh INVITE
		containing a SDP
		indicating sendonly to IMS_A
		}
		}

	2	TP_IMS_MGCF_14 step 36 (CPG):
		ensure that {
		when { IUT receives a CPG indicating remote_retrieve from PSTN }
		then { IUT sends an UPDATE or a target_refresh INVITE
		containing a SDP
		indicating sendonly to IMS_A
		}
		}

Step	Direction						Message	Comment
	User A	UE A	IMS A	MGCF	PSTN	User B		
								Follow UC_21 (1 to 27)
28								User A and B can communicate
29								User B sets A on hold
30				←			CPG	MGCF receives CPG " remote HOLD"
31			←				UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendonly) to IMS_A
32		←					UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to UE_A
33		→					200 OK	UE_A replies 200 OK to IMS_A
34			→				200 OK	IMS_A forwards 200 OK to MGCF
35								User A and B cannot communicate
36				←			CPG	MGCF receives CPG "remote RETRIEVE"
37			←				UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendrecv) to IMS_A
38		←					UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to UE_A
39		→					200 OK	UE_A replies 200 OK to IMS_A
40			→				200 OK	IMS_A forwards 200 OK to MGCF
41								User A and B can communicate
42					←			User A ends call
								Continue UC_21 (30A to 37A)

History

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