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Core Network and Interoperability Testing (INT);
IMS NNI Interoperability Test Specifications
(3GPP Release 10);
Part 2: Test descriptions for IMS NNI Interoperability

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ETSI

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

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

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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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)".

Introduction

The IP Multimedia core network Subsystem (IMS) is a key component in the ETSI NGN architecture. Each IMS consists of multiple functional entities and interfaces. The goal of this work is to provide the interoperability tests for standardized network to network interfaces (NNI) of the IMS core network that are based on SIP messages.

Test purposes defined in the present document have been developed based on the requirements stated in the 3GPP IMS Release 10 specification.

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 [15]. *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 [9]), CDIV (see TS 124 404 [10]), ACR-CB (see TS 124 411 [11]), and OIP/OIR (see TS 124 407 [12]) 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.

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 (V10.10.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 version 10.10.0 Release 10)".

[2] ETSI TS 186 011-1 (V5.1.1): "Core Network and Interoperability Testing (INT); IMS NNI Interoperability Test Specifications (3GPP Release 10); 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 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)".

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

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

[9] ETSI TS 124 410: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; TISPAN; NGN Signalling Control Protocol; Communication HOLD (HOLD) PSTN/ISDN simulation services; Protocol specification (3GPP TS 24.410)".

[10] 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)".

[11] ETSI TS 124 411: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; TISPAN; PSTN/ISDN simulation services: Anonymous Communication Rejection (ACR) and Communication Barring (CB); Protocol specification (3GPP TS 24.411)".

[12] ETSI TS 124 407: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; TISPAN; PSTN/ISDN simulation services; Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR); Protocol specification (3GPP TS 24.407)".

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

[14] 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)".

[15] ETSI TS 129 165 (V10.10.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Inter-IMS Network to Network Interface (NNI) (3GPP TS 29.165 version 10.10.0 Release 10)".

[16] ETSI TS 102 901 (V5.1.1): "Core Network and Interoperability Testing (INT); IMS NNI Interoperability Test Specifications; IMS NNI interoperability test descriptions for RCS (3GPP Release 10)".

[17] ETSI TS 129 163 (V10.8.0): "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 10.8.0 Release 10)".

[18] ETSI TS 103 189 (V1.1.1): "IMS Network Testing (INT); Specification of end-to-end QoS assessment for LTE and RCS Interop Events or Plugtests".

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)".

[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)".

[i.3] ETSI TR 184 008: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Infrastructure ENUM Options for a TISPAN IPX".

[i.4] IETF RFC 3761: "The E.164 to Uniform Resource Identifiers (URI); Dynamic Delegation Discovery System (DDDS) Application (ENUM)".

[i.5] GSMA PRD IR.67: "DNS/ENUM Guidelines for Service Providers & GRX/IPX Providers" version 5.1.

[i.6] IETF RFC 3403: "Dynamic Delegation Discovery System (DDDS), Part Three: The Domain Name System (DNS) Database".

3 Abbreviations

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

3GPP	3rd Generation Partnership Project
ACK	ACKnowledge
ACL	Automatic Congestion Level
ACM	Address Complete Message
ACR	Anonymous Communication Rejection
ACR-CB	Anonymous Communication Rejection - Communication Barring
AKA	Authentication and Key Agreement
ALG	Application Level Gateway
ANM	Answer Message
AS	(IMS) Application Server
ATS	Abstract Test Suite
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
CONF	CONFerence
CPG	Call Progress Message
CS	Circuit Switched
CSCF	Call Session Control Function
DB	Enum database
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
ENUM	E.164 Number Mapping
GSM	Global System for Mobile Communications
GSMA	GSM Association
HOLD	Communication HOLD
HSS	Home Subscriber Server
HTTP	Hyper Text Transfer Protocol
IAM	Initial Address Message
IAM_A	Not applicable
IBCF	Interconnection Border Control Gateway
I-CSCF	Interrogating CSCF
IFC	Initial Filter Criteria
II-NNI	Not applicable
IM	IP Multimedia
IMS	IP Multimedia Subsystem
IOI	Inter Operator Identifier
IP	Internet Protocol
IPsec	Internet Protocol security
IPTV	IP Television
IPX	Internet Packet eXchange
IR	Not applicable, document reference
ISC	IMS Service Control

ISDN	Integrated Service Digital Network
ISUP	ISDN User Part
IUT	Implementation Under Test
MF	Media Function
MGCF	Media Gateway Control Function
MGF	Media Gateway Function
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
MSRP	Message Session Relay Protocol
MTP	Message Transfer Part
NAPTR	Naming Authority Pointer
NGN	Next Generation Networks
NNI	Network-to-Network Interface
N-PVR	Network based Personal Video Recording
NS	Name Server
NWK	NetWorK
OCB	Outgoing Communication Barring
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
PCM	Pulse Code Modulation
PCO	Point of Control and Observation
PCRF	Policy and Charging Rules Function
P-CSCF	Proxy CSCF
PO	Point of Observation
PoI	Point of Interconnection
PRACK	Reliability of Provisional Responses
PRD	Not applicable, document reference
PSTN	Public Switched Telephone Network
PVR	Personal video recorder services
QoS	Quality of Service
REL	RELease
RLC	Release Complete Message
RTP	Realtime Transport Protocol
RTSP	Real Time Streaming Protocol
SA	Security Association
SCF	Session Control Function
S-CSCF	Serving CSCF
SCTP	Stream Control Transmission Protocol
SDF	Service Discovery Function
SDP	Session Description Protocol
SGF	Signalling Gateway Function
SIP	Session Initiation Protocol
SS	Simulation Services
SUT	System Under Test
TC	Test Case
TCP	Transmission Control Protocol
TD	Test Description
TEL	TELephony
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
TN	Telephone Number
TP	Test Purpose
TPLan	Test Purpose Notation
TSS	Test Suite Structure
TTL	Time to live
UC	Use Case
UC_2_I	Not applicable
UDP	User Datagram Protocol
UE	User Equipment
URI	Uniform Record Identifier
VoIP	Voice over Internet Protocol
XML	eXtensible Markup Language

4 IMS NNI Interoperability Test Specification

4.1 Introduction

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

4.2 Test Prerequisites

4.2.1 IP Version

These test specifications are based on the use of IPv4 for SIP message transport throughout all IMS nodes as specified in TR 123 981 [i.2] but do not exclude the use of IPv6 in the case that all involved IMS nodes support this version of the IP protocol.

4.2.2 Authentication and Security

The current test specification supports as default full IMS TS 133 203 [6] 3GPP security. Non-compliance with full IMS security features defined in TS 133 203 [6] 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 [6].	
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 [7].	
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.

4.2.5 Number Resolution

"ENUM (RFC 3761 [i.4]) is a capability that transforms E.164 numbers into domain names and then uses the DNS (Domain Name System) to discover NAPTR records that specify the services available for a specific domain name." (TR 184 008 [i.3]).

The test infrastructure focuses on the use of Infrastructure ENUM to map a telephone number into a SIP URI that could identify a specific point of interconnection (PoI) to that communication provider's network that could enable the originating party to establish communication with the associated terminating party either directly or through an IPX.

The Infrastructure ENUM platform has a tiered structure and provides authoritative, service specific information to the quering party. A combination of Tier 0, Tier 1 and Tier 2 registries enables global discovery of ENUM data.

When returning the SIP URI of a PoI the ENUM solution acts a hosted T2 ENUM registry for the number range holder. When returning a NS record the ENUM solution acts as either a Tier 0 or Tier 1 registry.

4.2.6 QoS aspects

The present document describes only the functional signalling aspects of the interworking of IMS networks.
TS 103 189 [18] defines a set of test descriptions that allow the evaluation of the Quality of Service (QoS) that is available on a connection established via the NNI interface between two UEs following the use cases and test descriptions described in the present document. Wherever QoS testing can be applied a link is given to the relevant clause of TS 103 189 [18].

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 shall 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 [8]).

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 [9]), CDIV (see TS 124 404 [10]), ACR-CB (see TS 124 411 [11]) or OIP/OIR (see TS 124 407 [12]). 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 [9]), CDIV (see TS 124 404 [10]), ACR-CB (see TS 124 411 [11]), OIP/OIR (see TS 124 407 [12]), IPTV(see TS 183 063 [13]) or Conference (see TS 124 247 [14]). 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.

4.3.3.2 ENUM

When testing a combination of local and external registries can be used to simulate all functions of the Tier 0, Tier 1 and Tier 2 registries operation plus all national and international interconnect scenarios. It is assumed that each IMS core may access a local ENUM solution and an external ENUM solution with query capabilities or a combination of local and external solutions to allow retrieval of ENUM data.

4.3.3.2.1 Local ENUM Solution

Each IMS may access a local ENUM solution with query capabilities which allows retrieval of authoritative stored ENUM data (usually Tier 2 data) or authoritative cached ENUM data (any Tier).

4.3.3.2.2 Common ENUM Solution

An external ENUM registry is provided by the GSMA PRD IR.67 [i.5] to simulate a Tier 0 global root, national Tier 1 registries and off board Tier 2 registries. Depending on the scenario in simulation the registry allows to resolve a TN either directly with the SIP URI of the appropriate interconnection point or indirectly with a NS record of the destination operator. The NS record can then be used by the local ENUM solution to obtain a SIP URI. The test participants select the required features in order to implement particular simulation scenarios.

For the test participants the registry offers:

- an interface to manage user accounts;
- a provisioning interface for entering relevant information (E.164 number, SIP URI or NS record etc.) into the database; and
- a query interface accepting NAPTR queries and responding with NAPTR responses. As an example, the ENUM service should have an entry to map E.164 number (e.g. +33633348273) to the SIP URI of userSIP. Alternatively the response can also contain a NS record.

4.3.3.2.3 Node Configuration

The common ENUM solution should be configured to support a proper resolution of E.164 TNs into SIP URIs as defined in GSMA PRD IR.67 [i.5], clause 5.44 with reference to RFC 3761 [i.4] and RFC 3403 [i.6].

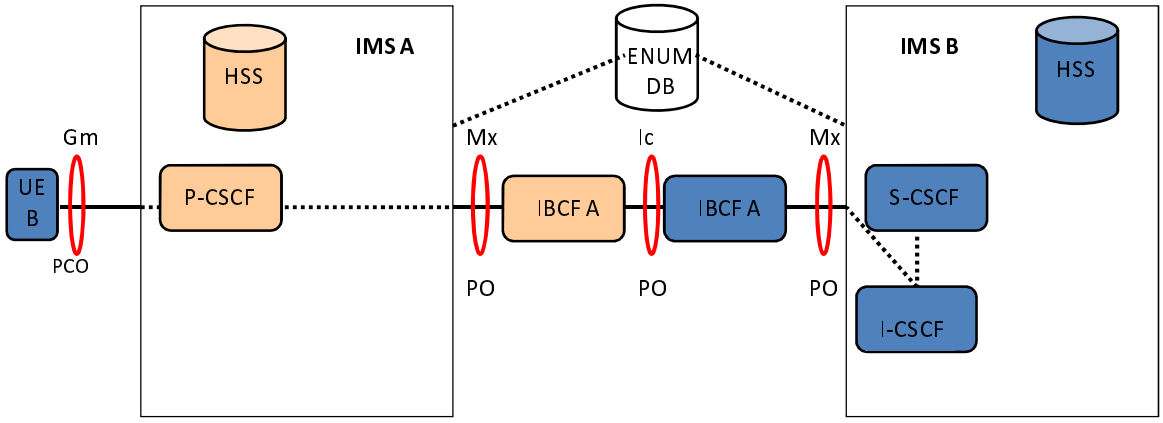
4.3.4 Test Configurations

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, a common interconnect ENUM DB and local ENUM is involved, IBCF is involved but no topology hiding performed.

Test configuration for:

Registration requests and responses from UE_B

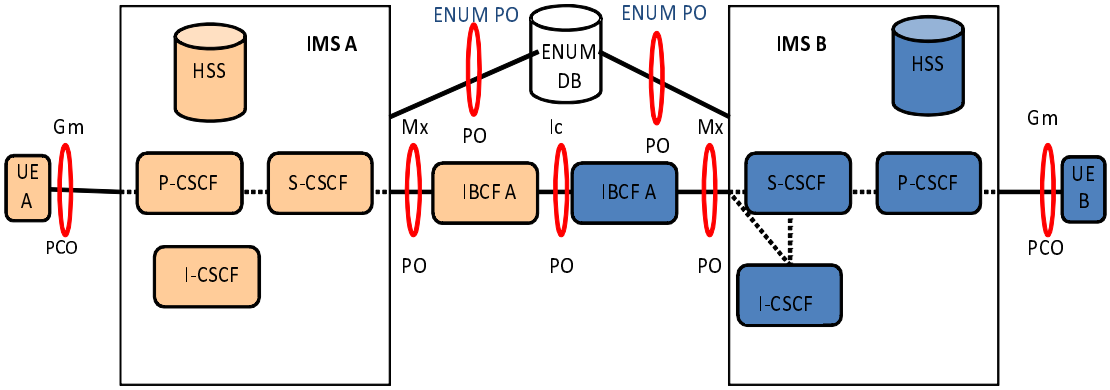
Example:

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 Ues registered, no AS, a common interconnect ENUM DB and local ENUM is 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 initiall requests and responses from UE_A (when UE_B is nor registered)

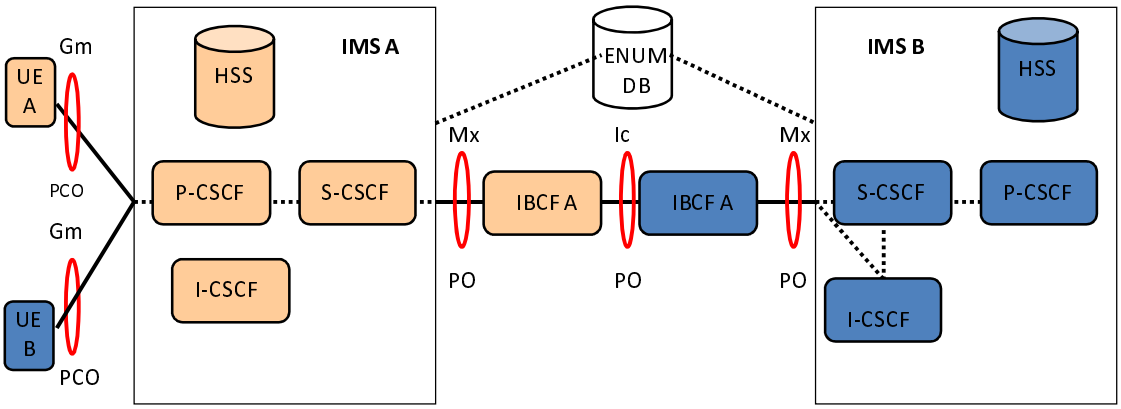
Example:

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, a common interconnect ENUM DB and local ENUM is involved, IBCF is involved, topology hiding may apply.

Test configuration for:

Requests and responses between UE_B and UE_A in call (CALL) and messaging scenarios

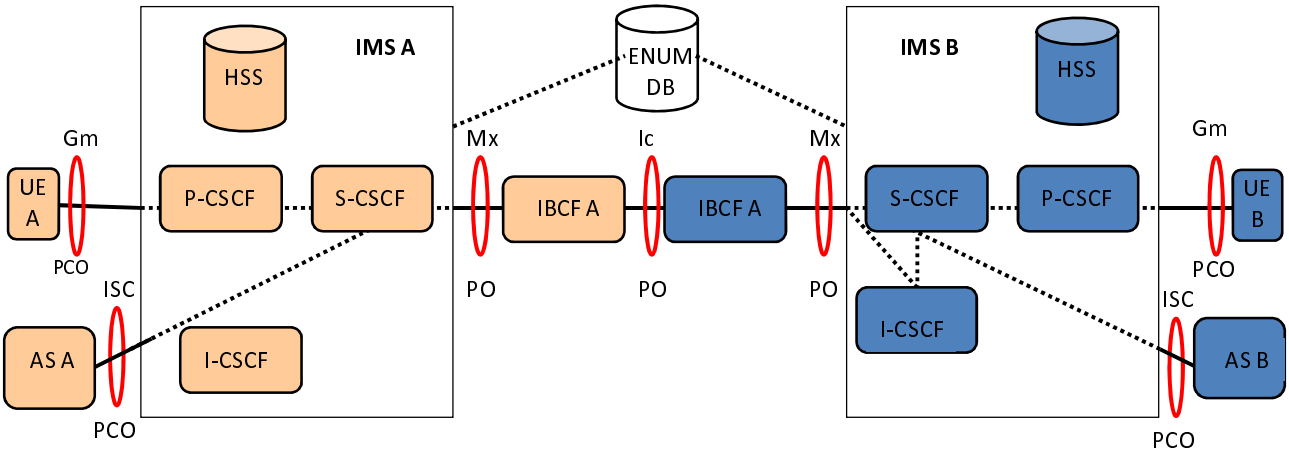
Example:

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), a common interconnect ENUM DB and local ENUM is involved, IBCF is involved, topology hiding may apply.

Test configuration for:

Requests and responses between ASes and UEs

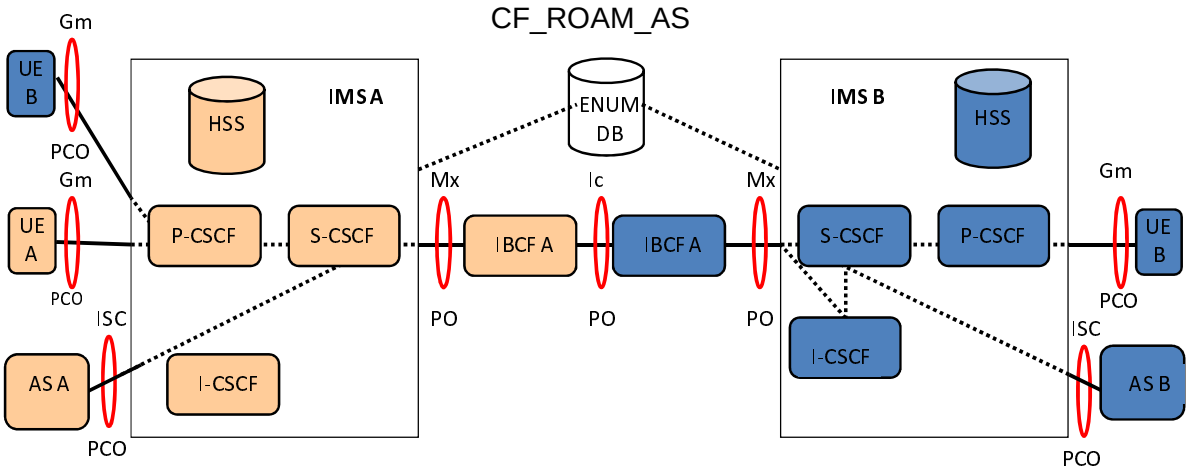
Example:

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

Roaming Application Server

CF_ROAM_AS



Precondition:

Different network operators performing origination and termination, UE_B roaming (ROAM) via IMS_A, UE_A in home network, both Ues are registered, AS for UE_A and UE_B may be involved (AS), a common interconnect ENUM DB and local ENUM is involved, IBCF is involved, topology hiding may apply.

Test configuration for:

Requests and responses between AS_B and UEs

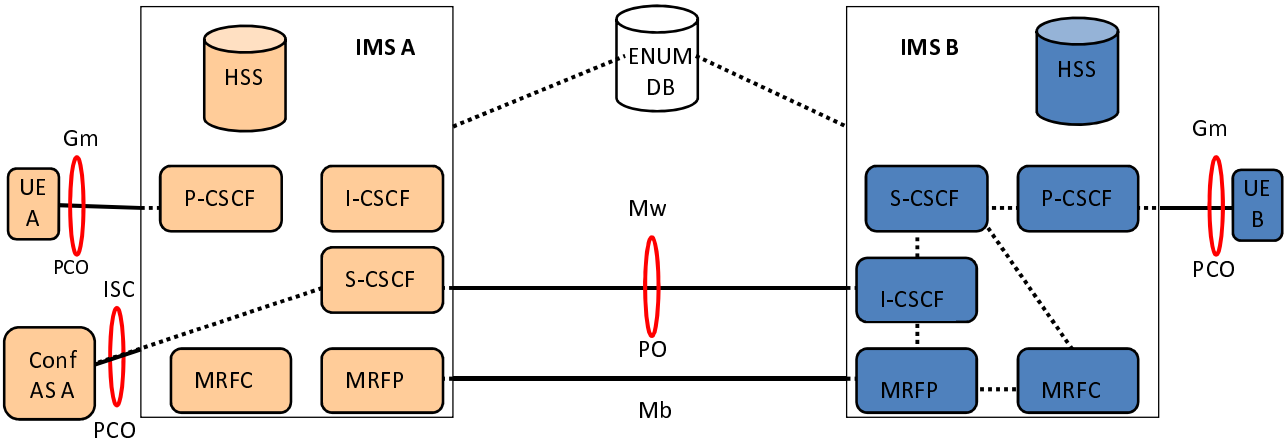
Example:

Initial INVITE in IMS VoIP voice call unconditionally forwarded to UE_B by AS_B (CFU), AS_B acts as routing AS

Figure 5: CF_ROAM_AS

Interworking Conference Server

CF_INT_CONF_AS



Precondition:

Different network operators performing origination and termination, both Ues or only UE_A in home networks (INT), both UEs registered, CONF AS is involved in IMS_A, a common interconnect ENUM DB and local ENUM is involved, 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)

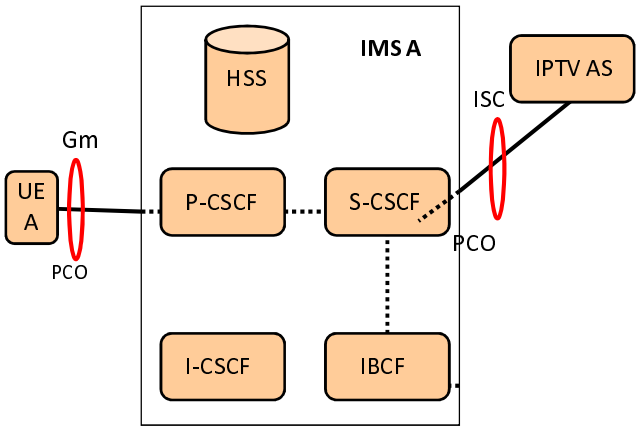
Example:

Initial INVITE 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 involved

Test configuration for:

Requests and responses between UE_A and IPTV AS

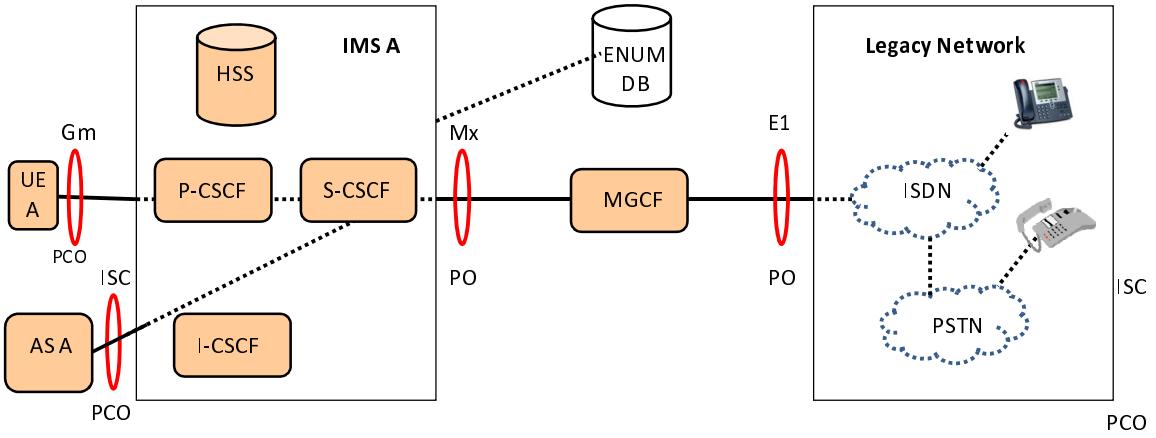
Example:

Initial INVITE from UE_A to initiate an IPTV Broadcast session

Figure 7: CF_IPTV

PSTN Interworking

CF_PSTN



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), a common interconnect ENUM DB and local ENUM is involved, 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 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 46

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

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

4.4.2 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.

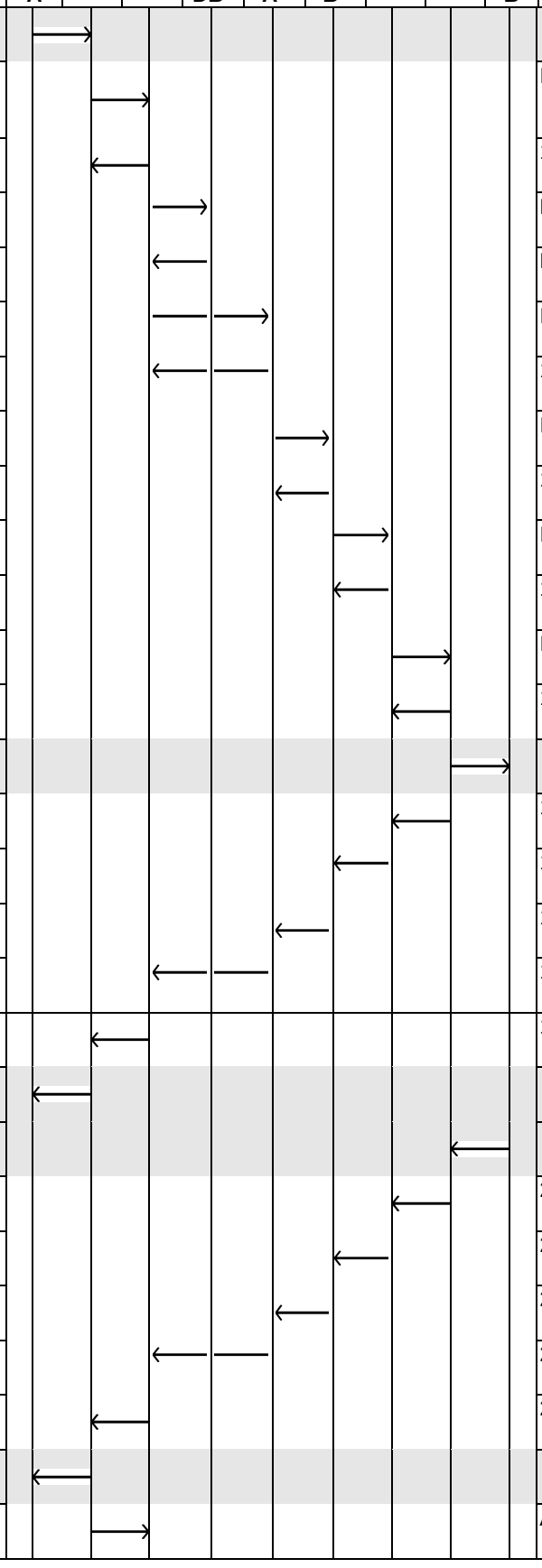
The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering).

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

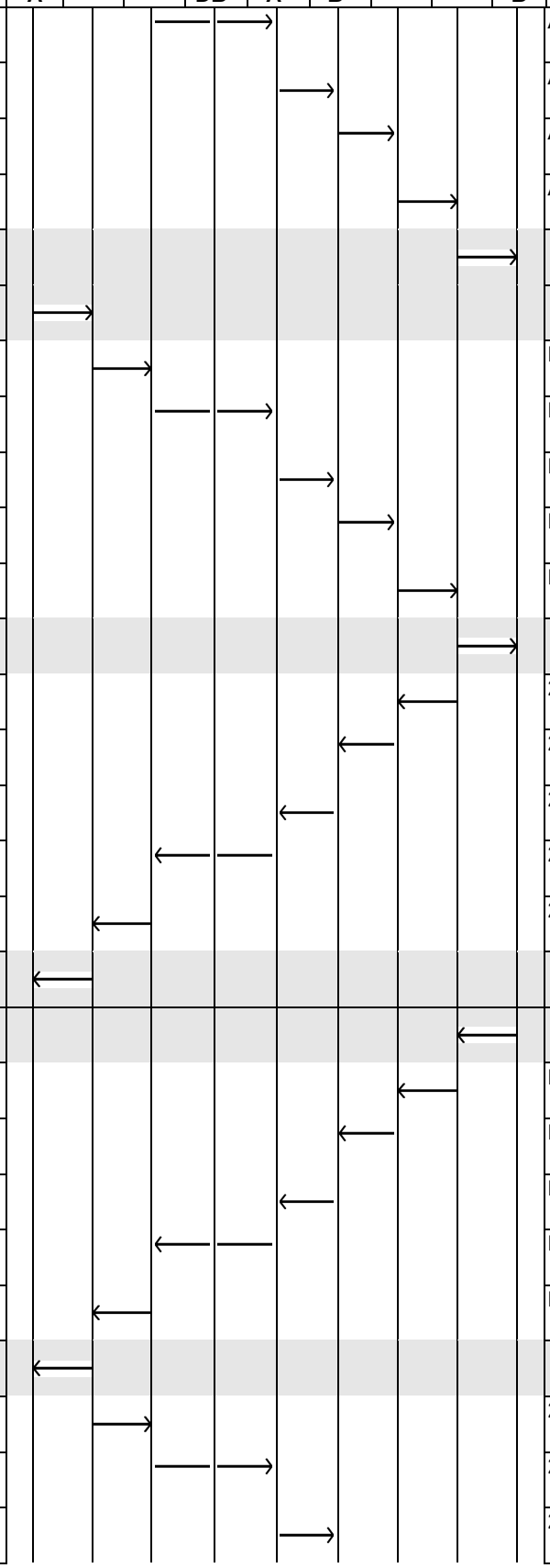
The test sequence and expected call flow sequence when user A calls user B in an interworking scenario is:

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 14
3	User A is informed that UE_B is ringing	Step 20
4	User B answers call	Step 21
5	User A is informed that call has been answered	Step 27
6	User B is informed that the call is established	Step 33
7A	User A ends call	Step 34A
7B	User B ends call	Step 34B
8A	User B is informed that call has ended	Step 40A
8B	User A is informed that call has ended	Step 40B
9A	User A is informed that call has ended	Step 46A
9B	User B is informed that call has ended	Step 46B

NOTE: After step 33 in the below message sequence chart the quality assessment test description as described in clause 4.1.1 of TS 103 189 [18] can be applied.



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	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										ENUM	IMS_A sends query to ENUM DB
5										ENUM	ENUM DB sends response to IMS_A
6										INVITE	IMS_A forwards INVITE to IBCF_A
7										100 Trying	IBCF_A responds with a 100 Trying provisional response
8										INVITE	IBCF_A forwards INVITE to IBCF_B
9										100 Trying	IBCF_B responds with a 100 Trying provisional response
10										INVITE	IBCF_B forwards INVITE to IMS_B
11										100 Trying	IMS_B responds with a 100 Trying provisional response
12										INVITE	IMS_B forwards INVITE to UE_B
13										100 Trying	UE_B optionally responds with a 100 Trying provisional response
14											User B is informed of incoming call of User A
15										180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16										180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
17										180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
18										180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
19										180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20											User A is informed that UE_B is ringing
21											User B answers call
22										200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
23										200 OK	IMS_B forwards 200 OK response to IBCF_B
24										200 OK	IBCF_B forwards 200 OK response to IBCF_A
25										200 OK	IBCF_A forwards 200 OK response to IMS_A
26										200 OK	IMS_A forwards 200 OK response to UE_A
27											User A is informed that call has been answered
28										ACK	UE_A acknowledges the receipt of 200 OK for INVITE



Step	Direction	Message	Comment
29	IMSA → IBCFA	ACK	IMS_A forwards ACK to IBCF_A
30	IBCFA → IBCFB	ACK	IBCF_A forwards ACK to IBCF_B
31	IBCFB → IMSB	ACK	IBCF_B forwards ACK to IMS_B
32	IMSB → UEB	ACK	IMS_B forwards ACK to UE_B
33	UEB → User B		User B is informed that the call is established
34A	User A → UEA		User A ends call
35A	UEA → IMSA	BYE	UE_A releases the call with BYE
36A	IMSA → IBCFA	BYE	IMS_A forwards BYE to IBCF_A
37A	IBCFA → IBCFB	BYE	IBCF_A forwards BYE to IBCF_B
38A	IBCFB → IMSB	BYE	IBCF_B forwards BYE to IMS_B
39A	IMSB → UEB	BYE	IMS_B forwards BYE to UE_B
40A	UEB → User B		User B is informed that call has ended
41A	UEB → IMSB	200 OK	UE_B sends 200 OK for BYE
42A	IMSB → IBCFB	200 OK	IMS_B forwards 200 OK response to IBCF_B
43A	IBCFB → IBCFA	200 OK	IBCF_B forwards 200 OK response to IBCF_A
44A	IBCFA → IMSA	200 OK	IBCF_A forwards 200 OK response to IMS_A
45A	IMSA → UEA	200 OK	IMS_A forwards the 200 OK response to UE_A
46A	UEA → User A		User A is informed that call has ended
34A	User B → UEB		User B ends call
35A	UEB → IMSB	BYE	UE_B releases the call with BYE
36B	IMSB → IBCFB	BYE	IMS_B forwards BYE to IBCF_B
37B	IBCFB → IBCFA	BYE	IBCF_B forwards BYE to IBCF_A
38B	IBCFA → IMSA	BYE	IBCF_A forwards BYE to IMS_A
39B	IMSA → UEA	BYE	IMS_A forwards BYE to UE_A
40B	UEA → User A		User A is informed that call has ended
41B	UEA → IMSA	200 OK	UE_A sends 200 OK for BYE
42B	IMSA → IBCFA	200 OK	IMS_A forwards 200 OK response to IBCF_A
43B	IBCFA → IBCFB	200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
44B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
45B							→			200 OK	IMS_B forwards the 200 OK response to UE_B
46B								→			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:

NOTE: After step 48 in the below message sequence chart the quality assessment test description as described in clause 4.1.1 of TS 103 189 [18] can be applied.

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			—	→						INVITE	IMS_A forwards INVITE to IBCF_A
7			←	—						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12						←				INVITE	IMS_B forwards INVITE to IBCF_B
13						→				100 Trying	IBCF_B responds with a 100 Trying provisional response
14							←			INVITE	IBCF_B forwards INVITE to IBCF_A
15							→			100 Trying	IBCF_A responds with a 100 Trying provisional response
16								←		INVITE	IBCF_A forwards INVITE to IMS_A
17								→		100 Trying	IMS_A responds with a 100 Trying provisional response

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
18			→	→	→	→	→			INVITE	IMS_A forwards 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
21			←	→	→	→	→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
22			→	→	→					180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
23					→	→				180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24						→	→			180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25						←	→			180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
26					←	→				180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27			←	→	→					180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28		←	→	→	→	→	→	→	→	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
29	←	←									User B is informed that UE_A is ringing
30								←			User B answers call
31			←	→	→	→	→	→	→	200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
32			→	→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
33					→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
34						→	→			200 OK	IBCF_B forwards 200 OK response 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 UE_A
39	←	←									User A is informed that call has been answered
40		→	→	→	→	→	→	→	→	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
41			→	→	→	→	→	→	→	ACK	IMS_A forwards ACK to IBCF_A
42					→	→	→	→	→	ACK	IBCF_A forwards ACK to IBCF_B
43						→	→	→	→	ACK	IBCF_B forwards ACK to IMS_B
44						←	→	→	→	ACK	IMS_B forwards ACK to IBCF_B
45					←	→	→	→	→	ACK	IBCF_B forwards ACK to IBCF_A

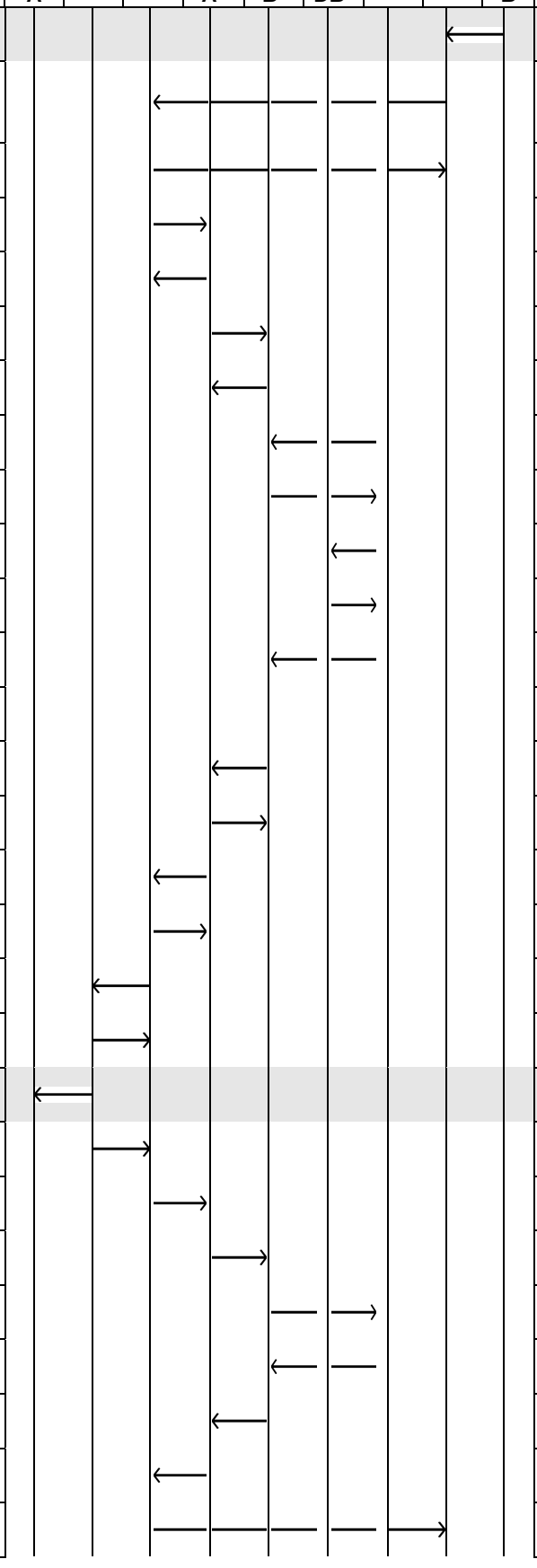
Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
46			←							ACK	IBCF_A forwards ACK to IMS_A
47			→	→	→	→	→	→		ACK	IMS_A forwards ACK to UE_B
48								→			User B is informed that the call is established
49A	→										User A ends call
50A		→								BYE	UE_A releases the call with BYE
51A			→	→						BYE	IMS_A forwards BYE to IBCF_A
52A					→					BYE	IBCF_A forwards BYE to IBCF_B
53A						→				BYE	IBCF_B forwards BYE to IMS_B
54A						←				BYE	IMS_B forwards BYE to IBCF_B
55A					←					BYE	IBCF_B forwards BYE to IBCF_A
56A			←	←						BYE	IBCF_A forwards BYE to IMS_A
57A			→	→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
58A								→			User B is informed that call has ended
59A			←	←	←	←	←			200 OK	UE_B sends 200 OK for BYE
60A			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
61A					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
62A						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
64A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
65A			←	←						200 OK	IBCF_A forwards 200 OK response to IMS_A
66A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
67A	←										User A is informed that call has ended
49B								←			User B ends call
50B			←	←	←	←	←			BYE	UE_B releases the call with BYE
51B			→							BYE	IMS_A forwards BYE to IBCF_A
52B				→						BYE	IBCF_A forwards BYE to IBCF_B
53B					→	→				BYE	IBCF_B forwards BYE to IMS_B
54B					←	←				BYE	IMS_B forwards BYE to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
55B				←						BYE	IBCF_B forwards BYE to IBCF_A
56B			←							BYE	IBCF_A forwards BYE to IMS_A
57B		←								BYE	IMS_A forwards BYE to UE_A
58B	←										User A is informed that call has ended
59B		→								200 OK	UE_A sends 200 OK for BYE
60B			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61B				→						200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B					→	→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63B					←					200 OK	IMS_B forwards 200 OK response to IBCF_B
64B				←						200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66B			→	→	→	→	→			200 OK	IMS_A forwards the 200 OK response to UE_B
67B								→			User B is informed that call has ended

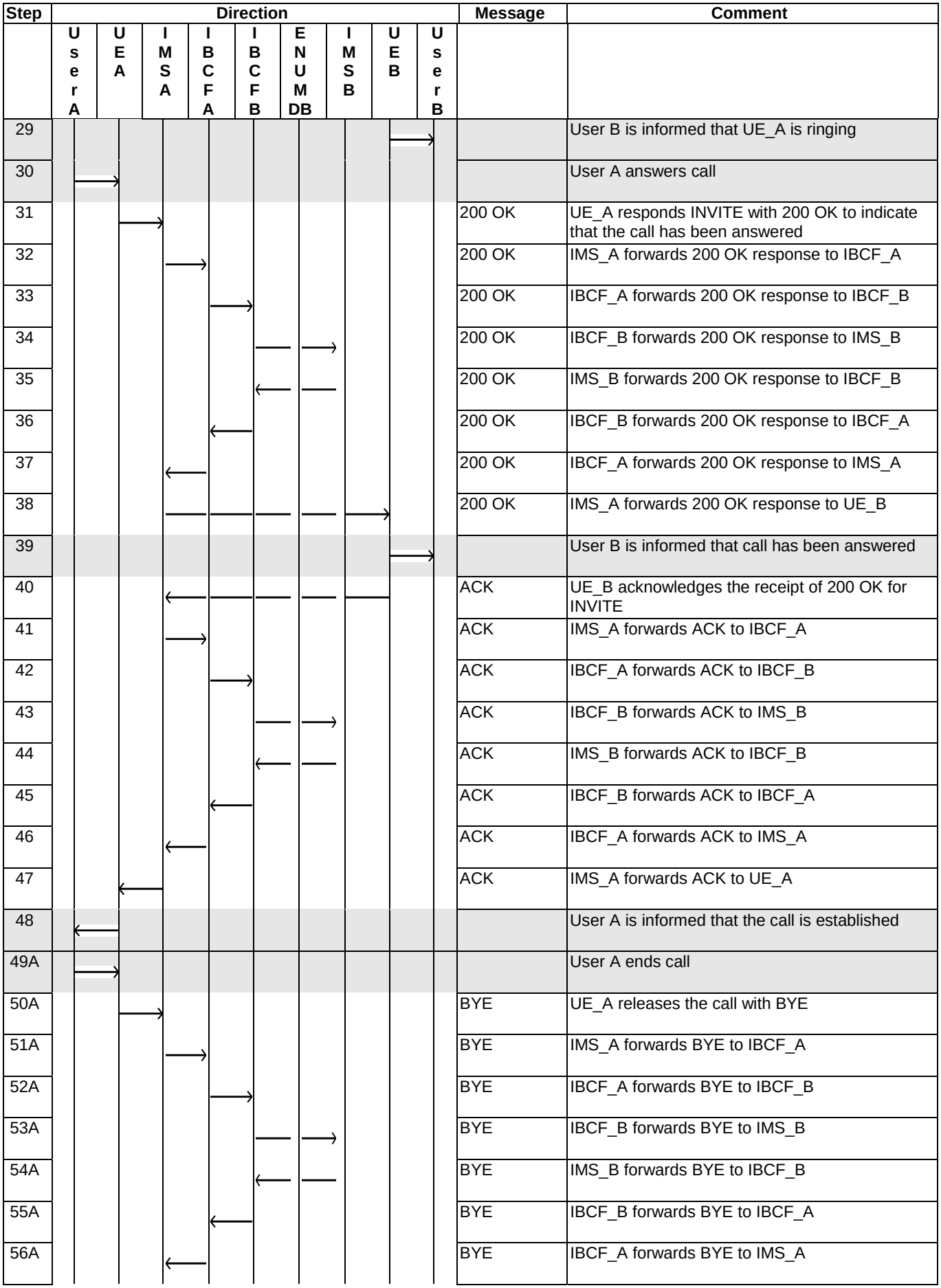
The test sequence and expected call flow sequence when user B calls user A in a roaming scenario is:

Step	Action	CF_ROAM_CALL
1	User B calls User A	Step 1
2	User A is informed of incoming call of User B	Step 20
3	User B is informed that UE_A is ringing	Step 29
4	User A answers call	Step 30
5	User B is informed that call has been answered	Step 39
6	User A is informed that the call is established	Step 48
7A	User A ends call	Step 49A
7B	User B ends call	Step 49B
8A	User B is informed that call has ended	Step 58A
8B	User A is informed that call has ended	Step 58B
9A	User A is informed that call has ended	Step 67A
9B	User B is informed that call has ended	Step 67B

NOTE: After step 48 in the below message sequence chart the quality assessment test description as described in clause 4.1.1 of TS 103 189 [18] can be applied.



Step	Direction	Message	Comment
	User A / UEA / IMSA / IBCFA / IBCFB / ENUMDB / 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		ENUM	IMS B sends query to ENUM DB
11		ENUM	ENUM DB sends response to IMS B
12		INVITE	IMS_B forwards INVITE to IBCF_B
13		100 Trying	IBCF_B responds with a 100 Trying provisional response
14		INVITE	IBCF_B forwards INVITE to IBCF_A
15		100 Trying	IBCF_A responds with a 100 Trying provisional response
16		INVITE	IBCF_A forwards INVITE to IMS_A
17		100 Trying	IMS_A responds with a 100 Trying provisional response
18		INVITE	IMS_A forwards 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
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 180 Ringing response to IBCF_A
23		180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24		180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25		180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
26		180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27		180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28		180 Ringing	IMS_A forwards the 180 Ringing response to UE_B



Step	Direction									Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
29								→			User B is informed that UE_A is ringing
30		→									User A answers call
31			→							200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
32				→						200 OK	IMS_A forwards 200 OK response to IBCF_A
33					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
34						→				200 OK	IBCF_B forwards 200 OK response 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 UE_B
39								→			User B is informed that call has been answered
40			←							ACK	UE_B acknowledges the receipt of 200 OK for INVITE
41				→						ACK	IMS_A forwards ACK to IBCF_A
42					→					ACK	IBCF_A forwards ACK to IBCF_B
43						→				ACK	IBCF_B forwards ACK to IMS_B
44					←					ACK	IMS_B forwards ACK to IBCF_B
45				←						ACK	IBCF_B forwards ACK to IBCF_A
46			←							ACK	IBCF_A forwards ACK to IMS_A
47		←								ACK	IMS_A forwards ACK to UE_A
48	←										User A is informed that the call is established
49A		→									User A ends call
50A			→							BYE	UE_A releases the call with BYE
51A				→						BYE	IMS_A forwards BYE to IBCF_A
52A					→					BYE	IBCF_A forwards BYE to IBCF_B
53A						→				BYE	IBCF_B forwards BYE to IMS_B
54A					←					BYE	IMS_B forwards BYE to IBCF_B
55A				←						BYE	IBCF_B forwards BYE to IBCF_A
56A			←							BYE	IBCF_A forwards BYE to IMS_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
57A			→	→	→	→	→	→		BYE	IMS_A forwards BYE to UE_B
58A								→			User B is informed that call has ended
59A			←							200 OK	UE_B sends 200 OK for BYE
60A			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61A				→						200 OK	IBCF_A forwards 200 OK response to IBCF_B
62A					→	→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63A					←					200 OK	IMS_B forwards 200 OK response to IBCF_B
64A				←						200 OK	IBCF_B forwards 200 OK response to IBCF_A
65A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
67A	←										User A is informed that call has ended
49B								←			User B ends call
50B			←							BYE	UE_B releases the call with BYE
51B			→							BYE	IMS_A forwards BYE to IBCF_A
52B				→						BYE	IBCF_A forwards BYE to IBCF_B
53B					→	→				BYE	IBCF_B forwards BYE to IMS_B
54B					←					BYE	IMS_B forwards BYE to IBCF_B
55B				←						BYE	IBCF_B forwards BYE to IBCF_A
56B			←							BYE	IBCF_A forwards BYE to IMS_A
57B		←								BYE	IMS_A forwards BYE to UE_A
58B	←										User A is informed that call has ended
59B		→								200 OK	UE_A sends 200 OK for BYE
60B			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61B				→						200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B					→	→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63B					←					200 OK	IMS_B forwards 200 OK response to IBCF_B
64B				←						200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
66B				———	———	———	———	——→		200 OK	IMS_A forwards the 200 OK response to UE_B
67B								——→			User B is informed that call has ended

4.4.3 User-initiated call hold and resume

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

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

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

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

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

4.4.3.1 User-initiated call hold and resume using reINVITE

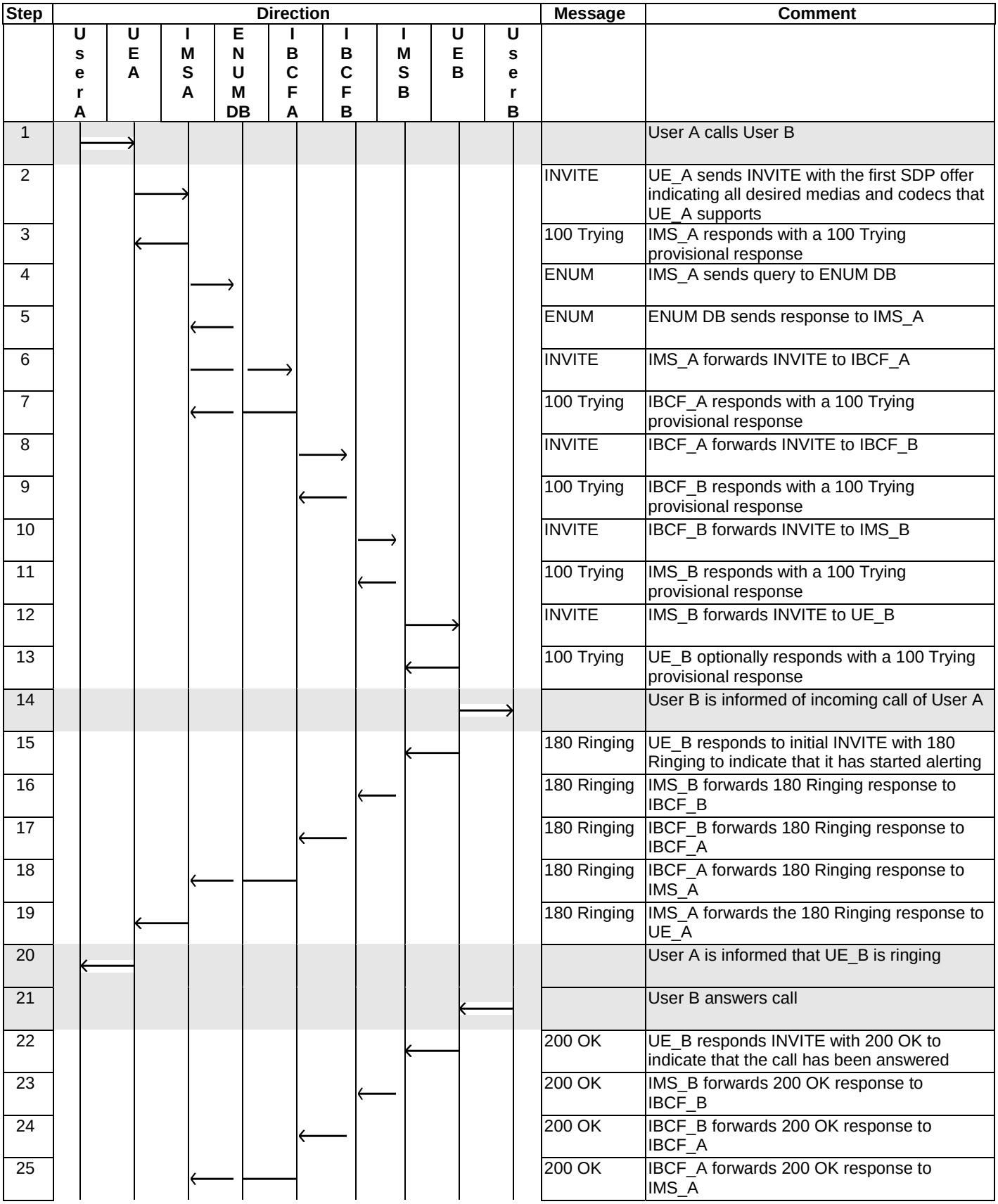
4.4.3.1.1 Description

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

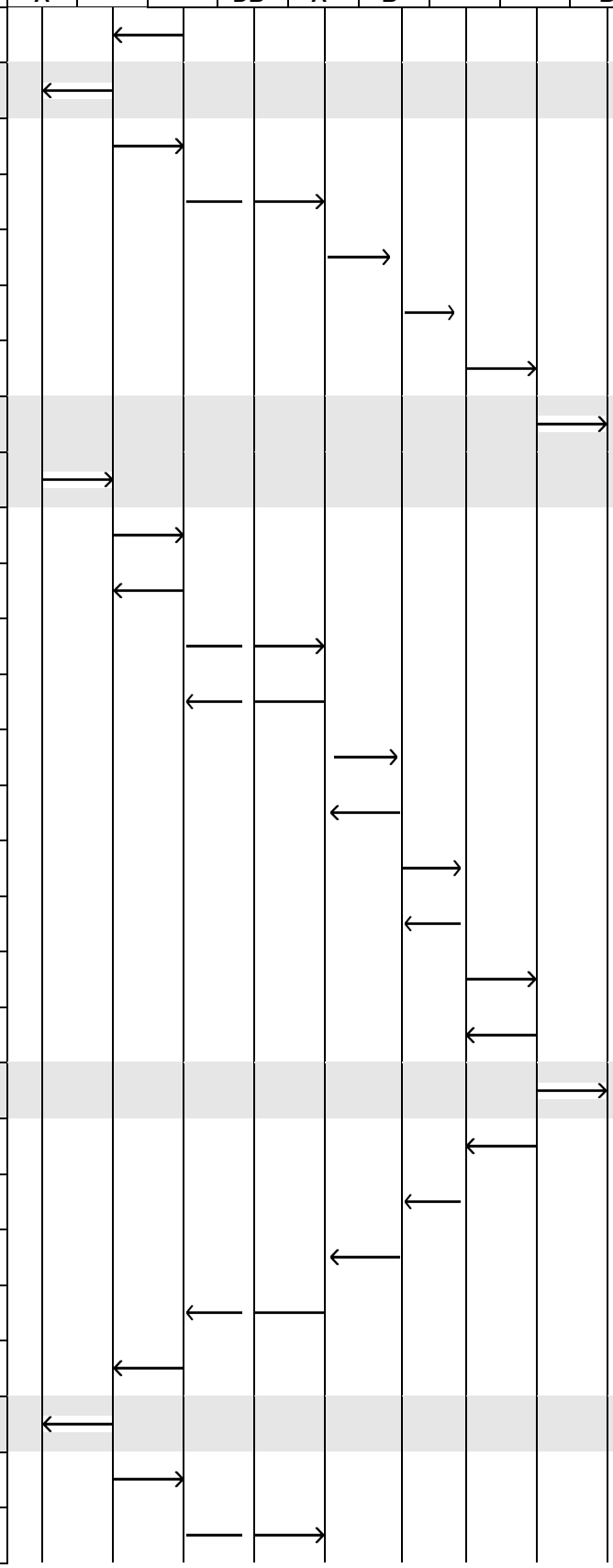
Step	Action	CF_INT_CALL	CF_ROAM_CALL
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	14	20
3	User A is informed that UE_B is ringing	20	29
4	User B answers call	21	30
5	User A is informed that call has been answered	23	39
6	User B is presented that call is established	33	48
7A	User A puts call on hold	34A	49A
7B	User B puts call on hold	34B	49B
8A	User B is informed that call on hold	51A	66A
8B	User A is informed that call on hold	51B	66B
9A	User A resumes call	57A	84A
9B	User B resumes call	57B	84B
10A	User B is informed that call is resumed	68A	101A
10B	User A is informed that call is resumed	68B	101B
11A	User A is informed that call is resumed	74A	110A
11B	User B is informed that call is resumed	74B	110B
12	User A ends call	75	111
13	User B is informed that call has ended	81	119
14	User A is informed that call has ended	87	129

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

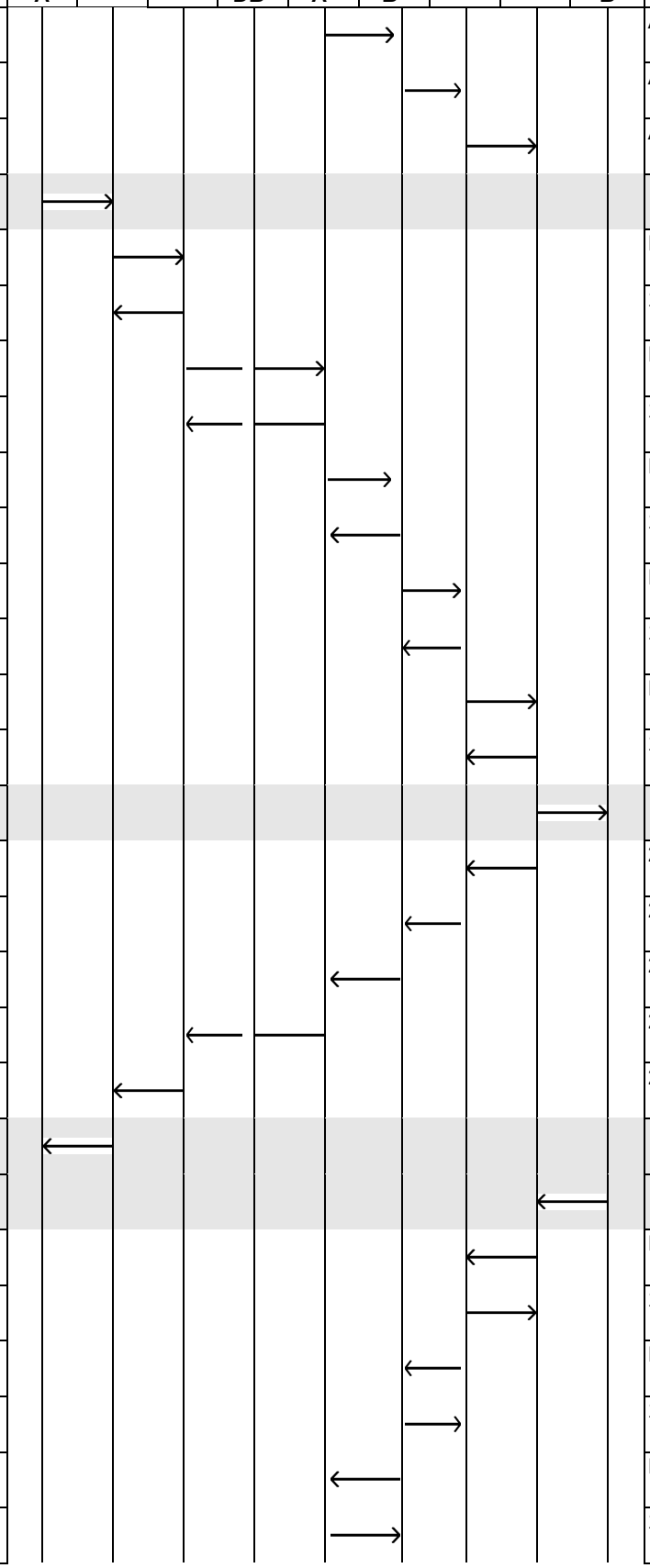
The expected call flow sequence is:



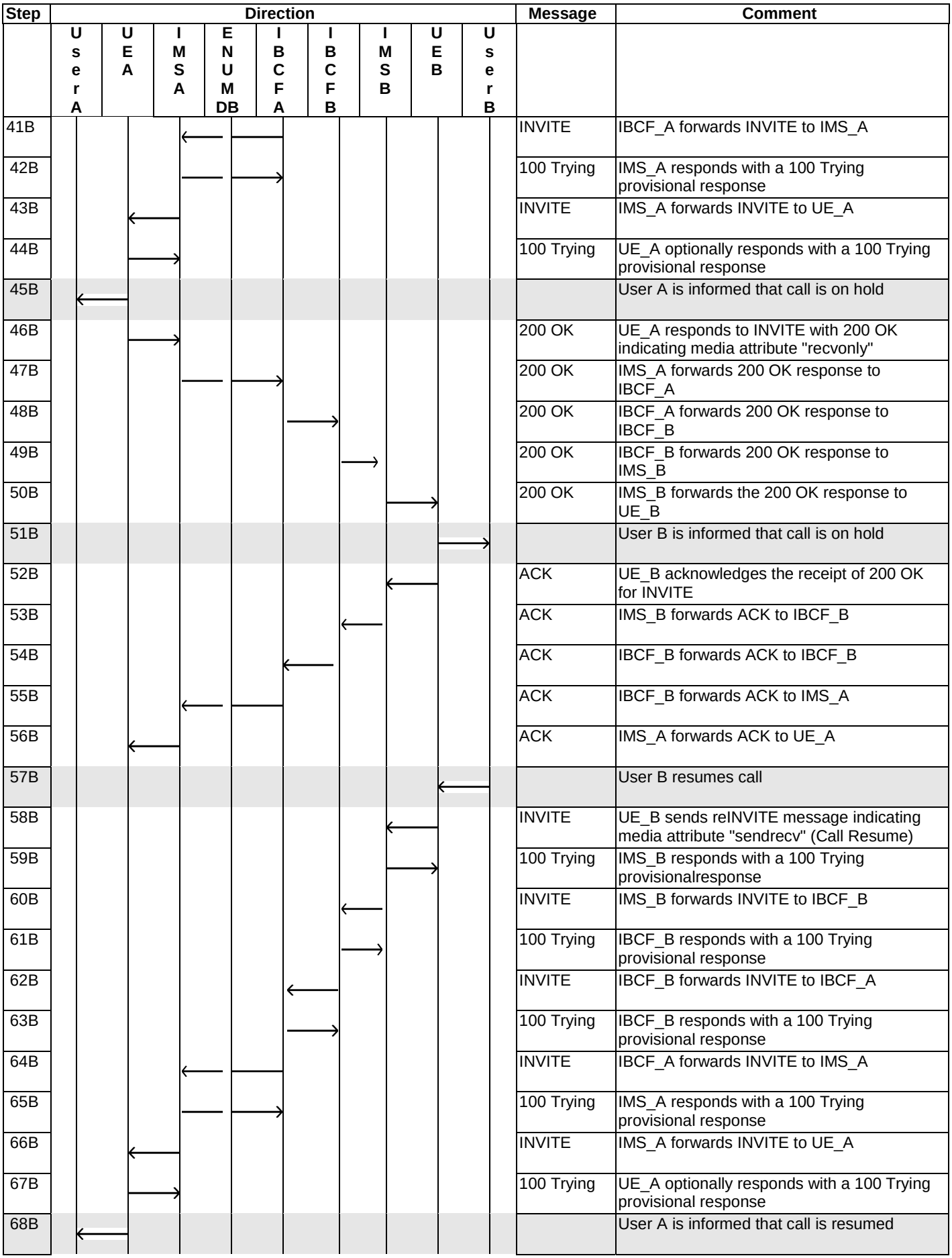
Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
1		→									User A calls User B
2			→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←								100 Trying	IMS_A responds with a 100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



Step	Direction	Message	Comment
	User A / UE A / IMS A / ENUM DB / IBCF A / IBCF B / IMS B / UE B / User B		
26		200 OK	IMS_A forwards 200 OK response to UE_A
27			User A is informed that call has been answered
28		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
29		ACK	IMS_A forwards ACK to IBCF_A
30		ACK	IBCF_A forwards ACK to IBCF_B
31		ACK	IBCF_B forwards ACK to IMS_B
32		ACK	IMS_B forwards ACK to UE_B
33			User B is presented that call is in progress
34A			User A puts call on hold
35A		INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
36A		100 Trying	IMS_A responds with a 100 Trying provisional response
37A		INVITE	IMS_A forwards INVITE to IBCF_A
38A		100 Trying	IBCF_A responds with a 100 Trying provisional response
39A		INVITE	IBCF_A forwards INVITE to IBCF_B
40A		100 Trying	IBCF_A responds with a 100 Trying provisional response
41A		INVITE	IBCF_B forwards INVITE to IMS_B
42A		100 Trying	IMS_B responds with a 100 Trying provisional response
43A		INVITE	IMS_B forwards INVITE to UE_B
44A		100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A			User B is informed that call is on hold
46A		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
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 A is informed that call is on hold
52A		ACK	UE_A acknowledges the receipt of 200 OK for INVITE
53A		ACK	IMS_A forwards ACK to IBCF_A



Step	Message	Comment
54A	ACK	IBCF_A forwards ACK to IBCF_B
55A	ACK	IBCF_B forwards ACK to IMS_B
56A	ACK	IMS_B forwards ACK to UE_B
57A		User A resumes call
58A	INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
59A	100 Trying	IMS_A responds with a 100 Trying provisional response
60A	INVITE	IMS_A forwards INVITE to IBCF_A
61A	100 Trying	IBCF_A responds with a 100 Trying provisional response
62A	INVITE	IBCF_A forwards INVITE to IBCF_B
63A	100 Trying	IBCF_A responds with a 100 Trying provisional response
64A	INVITE	IBCF_B forwards INVITE to IMS_B
65A	100 Trying	IMS_B responds with a 100 Trying provisional response
66A	INVITE	IMS_B forwards INVITE to UE_B
67A	100 Trying	UE_B optionally responds with a 100 Trying provisional response
68A		User B is informed that call is resumed
69A	200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
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 call is resumed
34B		User B puts call on hold
35B	INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
36B	100 Trying	IMS_B responds with a 100 Trying provisional response
37B	INVITE	IMS_B forwards INVITE to IBCF_B
38B	100 Trying	IBCF_B responds with a 100 Trying provisional response
39B	INVITE	IBCF_B forwards INVITE to IBCF_A
40B	100 Trying	IBCF_A responds with a 100 Trying provisional response


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

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
69B		→								200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "sendrecv"
70B			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
71B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
72B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
73B							→			200 OK	IMS_B forwards the 200 OK response to UE_B
74B								→			User B is informed that call is resumed
75	→										User A ends call
76		→								BYE	UE_A releases the call with BYE
77			→	→						BYE	IMS_A forwards BYE to IBCF_A
78					→					BYE	IBCF_A forwards BYE to IBCF_B
79						→				BYE	IBCF_B forwards BYE to IMS_B
80							→			BYE	IMS_B forwards BYE to UE_B
81								→			User B is informed that call has ended
82							←			200 OK	UE_B sends 200 OK for BYE
83						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
84					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
85			←	—						200 OK	IBCF_A forwards 200 OK response to IMS_A
86		←								200 OK	IMS_A forwards the 200 OK response to UE_A
87	←										User A is informed that call has ended

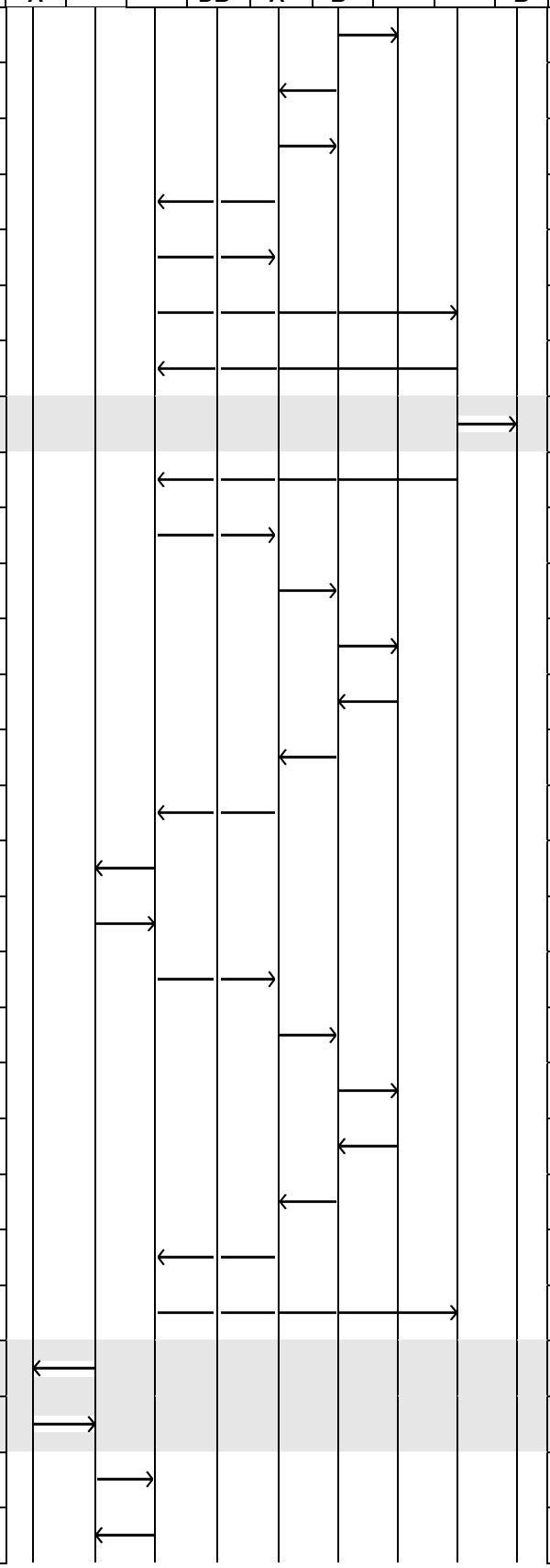
4.4.3.1.3 UC_03_R: SIP Call Flow "call hold and resume" using reINVITE with CF_ROAM_CALL

The expected call flow sequence is:

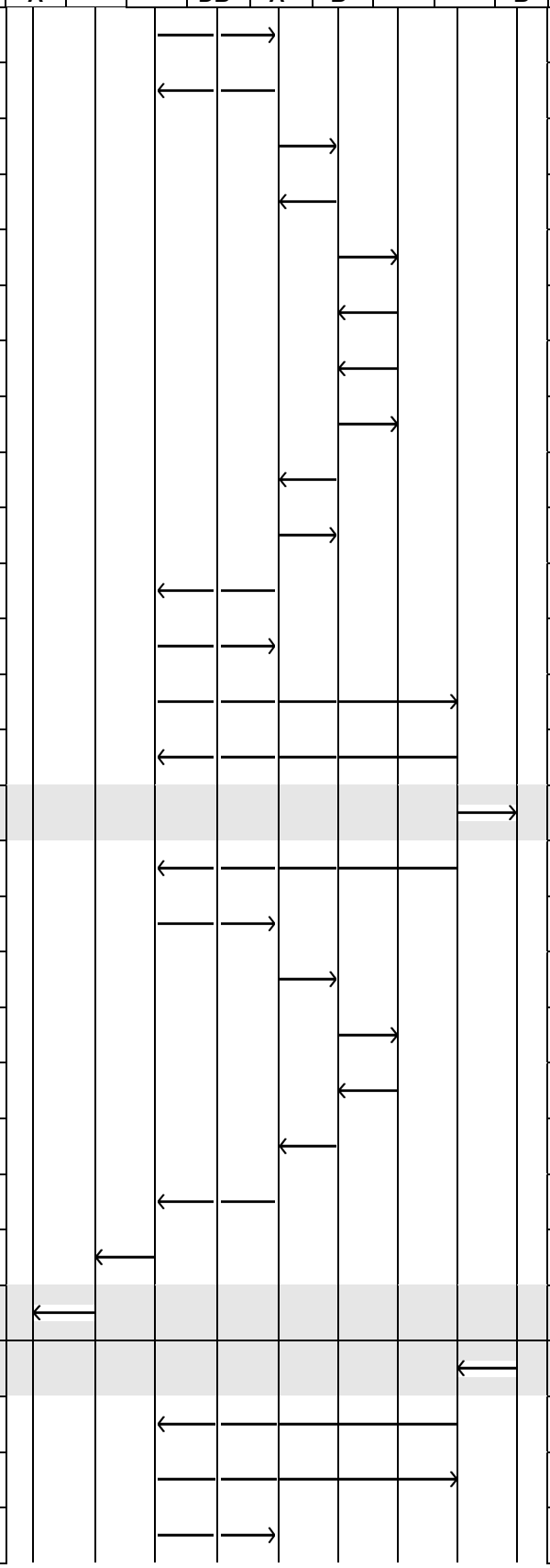
Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
1		→									User A calls User B
2			→							INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports

Step	Direction										Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B			
3			←								100 Trying	IMS_A responds with a 100 Trying provisional response
4				→							ENUM	IMS_A sends query to ENUM DB
5				←							ENUM	ENUM DB sends response to IMS_A
6				—	→						INVITE	IMS_A forwards INVITE to IBCF_A
7				←	—						100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→					INVITE	IBCF_A forwards INVITE to IBCF_B
9						←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10							→				INVITE	IBCF_B forwards INVITE to IMS_B
11							←				100 Trying	IMS_B responds with a 100 Trying provisional response
12							←				INVITE	IMS_B forwards INVITE to IBCF_B
13							→				100 Trying	IBCF_B responds with a 100 Trying provisional response
14						←					INVITE	IBCF_B forwards INVITE to IBCF_A
15						→					100 Trying	IBCF_A responds with a 100 Trying provisional response
16				←	—						INVITE	IBCF_A forwards INVITE to IMS_A
17				—	→						100 Trying	IMS_A responds with a 100 Trying provisional response
18				—	—	—	—	→			INVITE	IMS_A forwards 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
21				←	—	—	—	—			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
22				—	→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
23						→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24							→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25							←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
26						←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27				←	—						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28			←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
29		←										User A is informed that UE_B is ringing
30								←				User B answers call

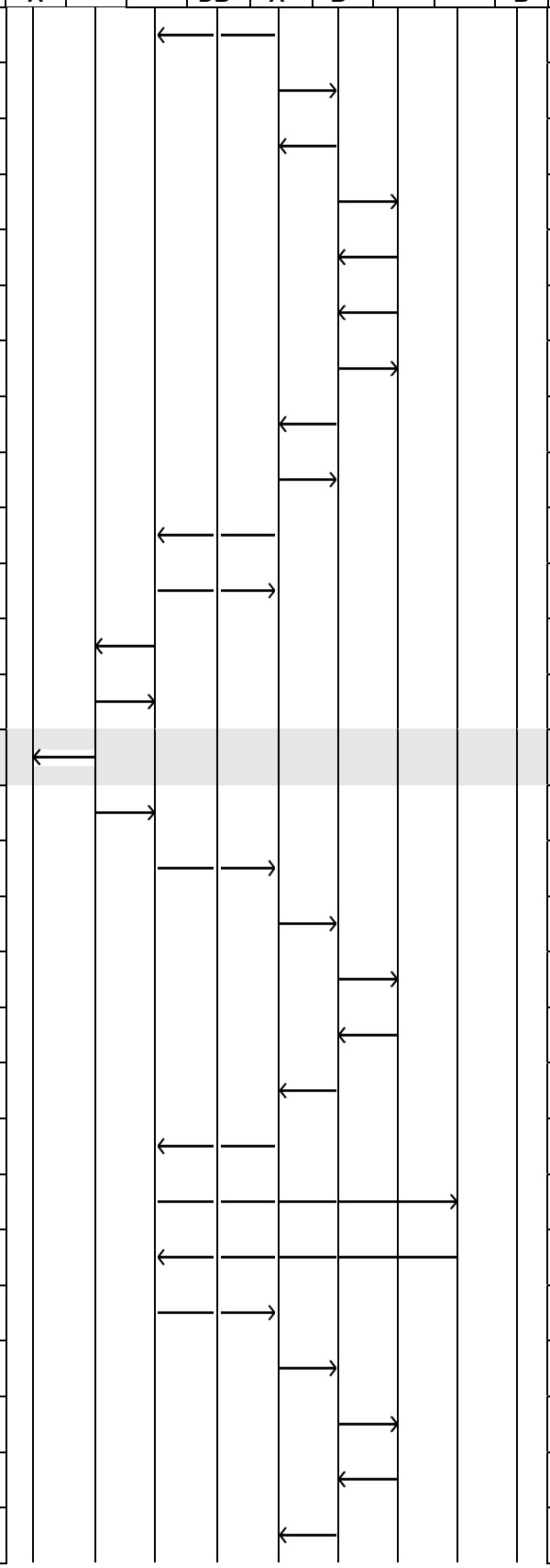
Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
31			←							200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
32				→						200 OK	IMS_A forwards 200 OK response to IBCF_A
33					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
34						→				200 OK	IBCF_B forwards 200 OK response 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 UE_A
39	←										User A is informed that call has been answered
40		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
41			→							ACK	IMS_A forwards ACK to IBCF_A
42					→					ACK	IBCF_A forwards ACK to IBCF_B
43						→				ACK	IBCF_B forwards ACK to IMS_B
44						←				ACK	IMS_B forwards ACK to IBCF_B
45					←					ACK	IBCF_B forwards ACK to IBCF_A
46			←							ACK	IBCF_A forwards ACK to IMS_A
47				→				→		ACK	IMS_A forwards ACK to UE_B
48									→		User B is presented that call is in progress
49A	→										User A puts call on hold
50A		→								INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
52A			→							INVITE	IMS_A forwards INVITE to IBCF_A
53A			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
54A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
55A					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
56A						→				INVITE	IBCF_B forwards INVITE to IMS_B
57A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
58A						←				INVITE	IMS_B forwards INVITE to IBCF_B



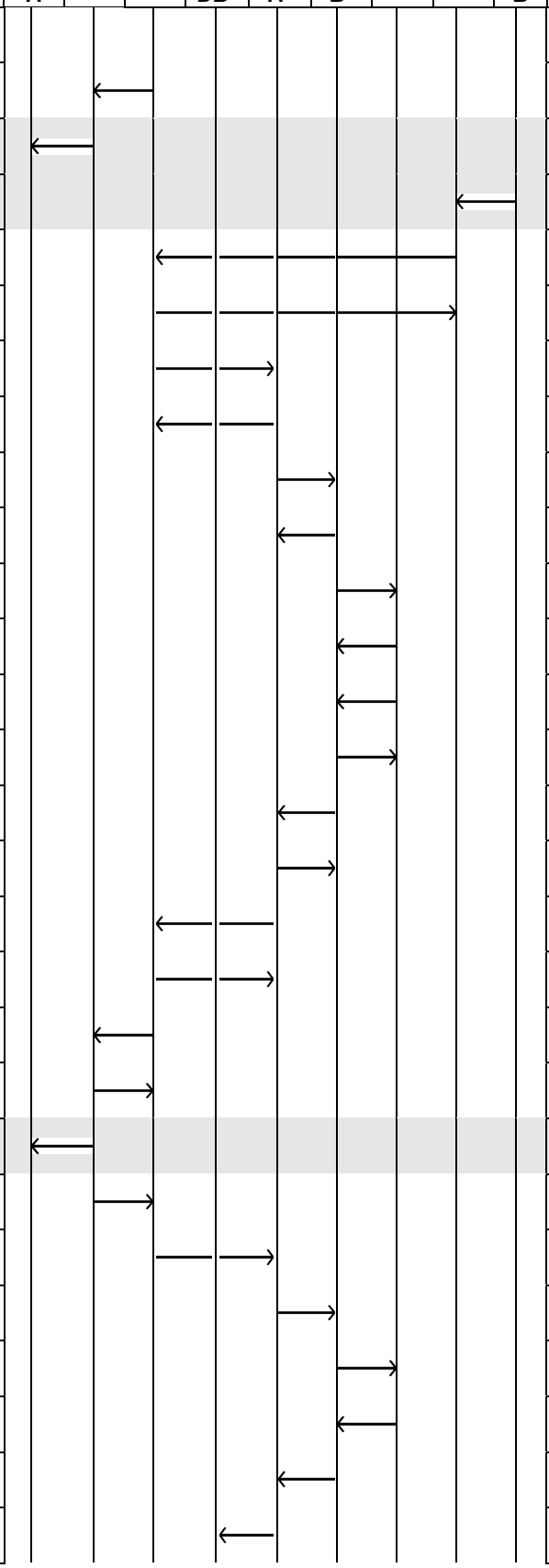
Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
59A										100 Trying	IBCF_B responds with a 100 Trying provisional response
60A										INVITE	IBCF_B forwards INVITE to IBCF_A
61A										100 Trying	IBCF_A responds with a 100 Trying provisional response
62A										INVITE	IBCF_A forwards INVITE to IMS_A
63A										100 Trying	IMS_A responds with a 100 Trying provisional response
64A										INVITE	IMS_A 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 on hold
67A										200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
68A										200 OK	IMS_A forwards 200 OK response to IBCF_A
69A										200 OK	IBCF_A forwards 200 OK response to IBCF_B
70A										200 OK	IBCF_B forwards 200 OK response to IMS_B
71A										200 OK	IMS_B forwards 200 OK response to IBCF_B
72A										200 OK	IBCF_B forwards 200 OK response to IBCF_A
73A										200 OK	IBCF_A forwards 200 OK response to IMS_A
74A										200 OK	IMS_A forwards 200 OK response to UE_A
75A										ACK	UE_A acknowledges the receipt of 200 OK for INVITE
76A										ACK	IMS_A forwards ACK to IBCF_A
77A										ACK	IBCF_A forwards ACK to IBCF_B
78A										ACK	IBCF_B forwards ACK to IMS_B
79A										ACK	IMS_B forwards ACK to IBCF_B
80A										ACK	IBCF_B forwards ACK to IBCF_A
81A										ACK	IBCF_A forwards ACK to IMS_A
82A										ACK	IMS_A forwards ACK to UE_B
83A											User A is informed that call is on hold
84A											User A resumes call
85A										INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
86A										100 Trying	IMS_A responds with a 100 Trying provisional response



Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
87A			→		→					INVITE	IMS_A forwards INVITE to IBCF_A
88A			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
89A					→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
90A					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
91A						→	→			INVITE	IBCF_B forwards INVITE to IMS_B
92A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
93A						←	←			INVITE	IMS_B forwards INVITE to IBCF_B
94A						→	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
95A					←					INVITE	IBCF_B forwards INVITE to IBCF_A
96A					→	→				100 Trying	IBCF_A responds with a 100 Trying provisional response
97A			←							INVITE	IBCF_A forwards INVITE to IMS_A
98A			→		→					100 Trying	IMS_A responds with a 100 Trying provisional response
99A			→		→	→	→	→		INVITE	IMS_A forwards INVITE to UE_B
100A			←		→	→	→	→		100 Trying	UE_B optionally responds with a 100 Trying provisional response
101A								→			User B is informed that call is resumed
102A			←		→	→	→	→		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
103A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
104A					→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
105A						→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
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 B is informed that call has ended
49B								←			User B puts call on hold
50B			←		←	←	←	←		INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51B			→		→	→	→			100 Trying	IMS_A responds with a 100 Trying provisional response
52B			→		→					INVITE	IMS_A forwards INVITE to IBCF_A



Step	Direction	Message	Comment
	User A / UEA / IMSA / ENUMDB / IBCFA / IBCFB / IMSB / UEB / User B		
53B		100 Trying	IBCF_A responds with a 100 Trying provisional response
54B		INVITE	IBCF_A forwards INVITE to IBCF_B
55B		100 Trying	IBCF_B responds with a 100 Trying provisional response
56B		INVITE	IBCF_B forwards INVITE to IMS_B
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_A 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 on hold
67B		200 OK	UE_A responds to INVITE with 200 OK indicating attribute "recvonly" inactive
68B		200 OK	IMS_A forwards 200 OK response to IBCF_A
69B		200 OK	IBCF_A forwards 200 OK response to IBCF_B
70B		200 OK	IBCF_B forwards 200 OK response to IMS_B
71B		200 OK	IMS_B forwards 200 OK response to IBCF_B
72B		200 OK	IBCF_B forwards 200 OK response to IBCF_A
73B		200 OK	IBCF_A forwards 200 OK response to IMS_A
74B		200 OK	IMS_A forwards 200 OK response to UE_B
75B		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
76B		ACK	IMS_A forwards ACK to IBCF_A
77B		ACK	IBCF_A forwards ACK to IBCF_B
78B		ACK	IBCF_B forwards ACK to IMS_B
79B		ACK	IMS_B forwards ACK to IBCF_B
80B		ACK	IBCF_B forwards ACK to IBCF_A



Step	Message	Comment
81B	ACK	IBCF_A forwards ACK to IMS_A
82B	ACK	IMS_A forwards ACK to UE_A
83B		User A is informed that call is on hold
84B		User B resumes call
85B	INVITE	UE_B sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
86B	100 Trying	IMS_A responds with a 100 Trying provisional response
87B	INVITE	IMS_A forwards INVITE to IBCF_A
88B	100 Trying	IBCF_A responds with a 100 Trying provisional response
89B	INVITE	IBCF_A forwards INVITE to IBCF_B
90B	100 Trying	IBCF_B responds with a 100 Trying provisional response
91B	INVITE	IBCF_B forwards INVITE to IMS_B
92B	100 Trying	IMS_B responds with a 100 Trying provisional response
93B	INVITE	IMS_B forwards INVITE to IBCF_B
94B	100 Trying	IBCF_B responds with a 100 Trying provisional response
95B	INVITE	IBCF_B forwards INVITE to IBCF_A
96B	100 Trying	IBCF_A responds with a 100 Trying provisional response
97B	INVITE	IBCF_A forwards INVITE to IMS_A
98B	100 Trying	IMS_A responds with a 100 Trying provisional response
99B	INVITE	IMS_A forwards INVITE to UE_A
100B	100 Trying	UE_A optionally responds with a 100 Trying provisional response
101B		User A is informed that call is resumed
102B	200 OK	UE_A responds to INVITE with 200 OK indicating media attribute "sendrecv"
103B	200 OK	IMS_A forwards 200 OK response to IBCF_A
104B	200 OK	IBCF_A forwards 200 OK response to IBCF_B
105B	200 OK	IBCF_B forwards 200 OK response to IMS_B
106B	200 OK	IMS_B forwards 200 OK response to IBCF_B
107B	200 OK	IBCF_B forwards 200 OK response to IBCF_A
108B	200 OK	IBCF_A forwards 200 OK response to IMS_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
109 B										200 OK	IMS_A forwards the 200 OK response to UE_B
110 B											User B is informed that call is resumed
111											User A ends call
112										BYE	UE_A releases the call with BYE
113										BYE	IMS_A forwards BYE to IBCF_A
114										BYE	IBCF_A forwards BYE to IBCF_B
115										BYE	IBCF_B forwards BYE to IMS_B
116										BYE	IMS_B forwards BYE to IBCF_B
117										BYE	IBCF_B forwards BYE to IBCF_A
118										BYE	IBCF_A forwards BYE to IMS_A
119										BYE	IMS_A forwards BYE to UE_B
120											User B is informed that call has ended
121										200 OK	UE_B sends 200 OK for BYE
122										200 OK	IMS_A forwards the 200 OK response to IBCF_A
123										200 OK	IBCF_A forwards 200 OK response to IBCF_B
124										200 OK	IBCF_B forwards 200 OK response to IMS_B
125										200 OK	IMS_B forwards 200 OK response to IBCF_B
126										200 OK	IBCF_B forwards 200 OK response to IBCF_A
127										200 OK	IBCF_A forwards 200 OK response to IMS_A
128										200 OK	IMS_A forwards the 200 OK response to UE_A
129											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	14	20
3	User A is informed that UE_B is ringing	20	29
4	User B answers call	21	30
5	User A is informed that call has been answered	27	39
6	User B is informed that call is established	29	48
7A	User A puts call on hold	34A	49A
7B	User B puts call on hold	34B	49B
8A	User B is informed that call on hold	40A	58A
8B	User A is informed that call on hold	40B	58B
9A	User A resumes call	52A	68A
9B	User B resumes call	52B	68B
10A	User B is informed that call is resumed	58A	77A
10B	User A is informed that call is resumed	58B	77B
11A	User A is informed that call is resumed	64A	86A
11	User A is informed that call is resumed	64B	86B
12	User A ends call	65	87
13	User B is informed that call has ended	71	96
14	User A is informed that call has ended	77	105

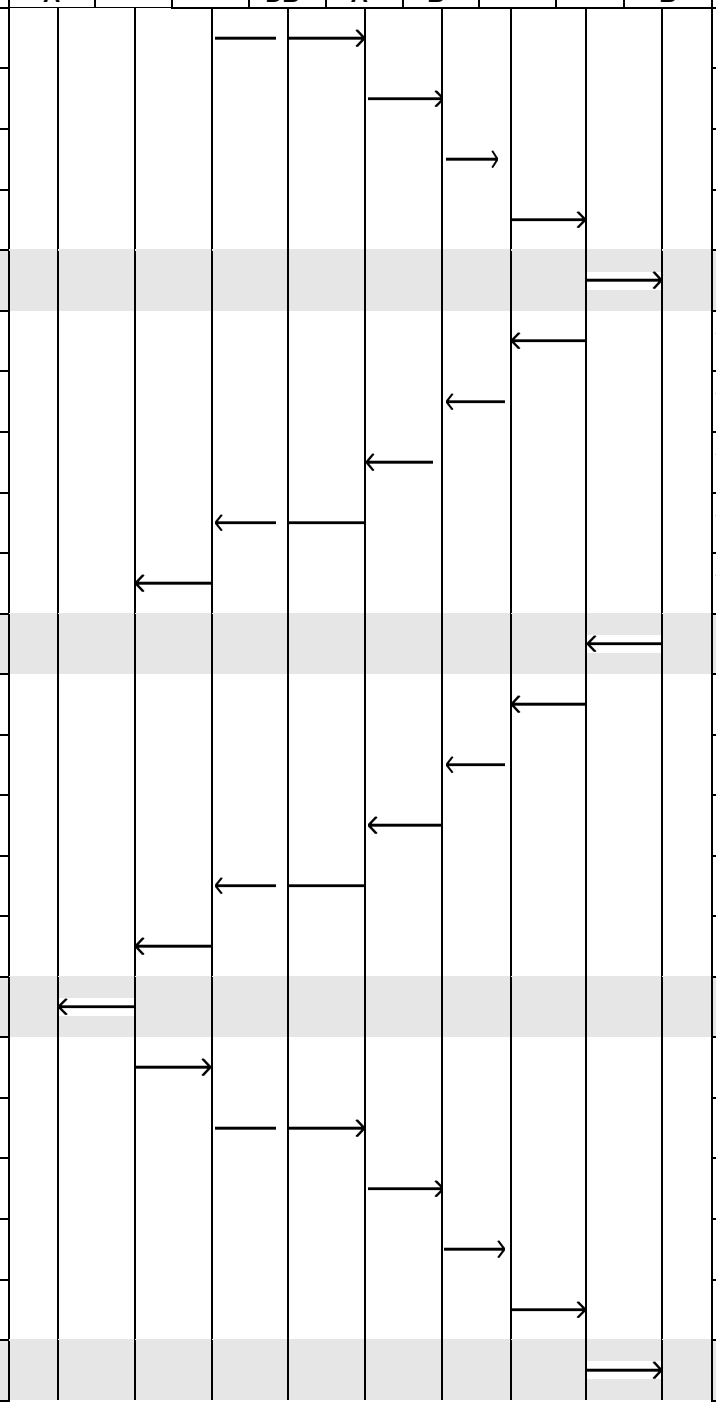
4.4.3.2.2 UC_04_I: SIP Call Flow "call hold and resume" using UPDATE with CF_INT_CALL

The expected call flow sequence is:

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			→	→						INVITE	IMS_A forwards INVITE to IBCF_A
7			←	←						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response

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

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
39A							→			UPDATE	IMS_B forwards UPDATE to UE_B
40A								→			User B is informed that call is on hold
41A							←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
42A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
43A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
44A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
45A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
46A	→										User A resumes call
47A		→								UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
48A			→							UPDATE	IMS_A forwards UPDATE to IBCF_A
49A					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
50A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
51A							→			UPDATE	IMS_B forwards UPDATE to UE_B
52A								→			User B is informed that call is resumed
53A							←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
54A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
55A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
56A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
57A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
58A	←										User A is informed that call is resumed
34B								←			User B puts call on hold
35B							←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
36B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
37B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
38B			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
39B		←								UPDATE	IMS_A forwards UPDATE to UE_A
40B	←										User A is informed that call is on hold
41B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "recvonly"



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
42B										200 OK	IMS_A forwards 200 OK response to IBCF_A
43B										200 OK	IBCF_A forwards 200 OK response to IBCF_B
44B										200 OK	IBCF_B forwards 200 OK response to IMS_B
45B										200 OK	IMS_B forwards the 200 OK response to UE_B
46B											User B is informed that call is on hold
47B										ACK	UE_B acknowledges the receipt of 200 OK for UPDATE
48B										ACK	IMS_B forwards ACK to IBCF_B
49B										ACK	IBCF_B forwards ACK to IBCF_A
50B										ACK	IBCF_A forwards ACK to IMS_A
51B										ACK	IMS_A forwards ACK to UE_A
52B											User B resumes call
53B										UPDATE	UE_B sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
54B										UPDATE	IMS_B forwards UPDATE to IBCF_B
55B										UPDATE	IBCF_B forwards UPDATE to IBCF_A
56B										UPDATE	IBCF_A forwards UPDATE to IMS_A
57B										UPDATE	IMS_A forwards UPDATE to UE_A
58B											User A is informed that call is resumed
59B										200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
60B										200 OK	IMS_A forwards 200 OK response to IBCF_A
61B										200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B										200 OK	IBCF_B forwards 200 OK response to IMS_B
63B										200 OK	IMS_B forwards the 200 OK response to UE_B
64B											User B is informed that call is resumed

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
65	→										User A ends call
66		→								BYE	UE_A releases the call with BYE
67			→	→						BYE	IMS_A forwards BYE to IBCF_A
68					→					BYE	IBCF_A forwards BYE to IBCF_B
69						→				BYE	IBCF_B forwards BYE to IMS_B
70							→			BYE	IMS_B forwards BYE to UE_B
71								→			User B is informed that call has ended
72							←			200 OK	UE_B sends 200 OK for BYE
73						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
74					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
75			←	—						200 OK	IBCF_A forwards 200 OK response to IMS_A
76		←								200 OK	IMS_A forwards the 200 OK response to UE_A
77	←										User A is informed that call has ended

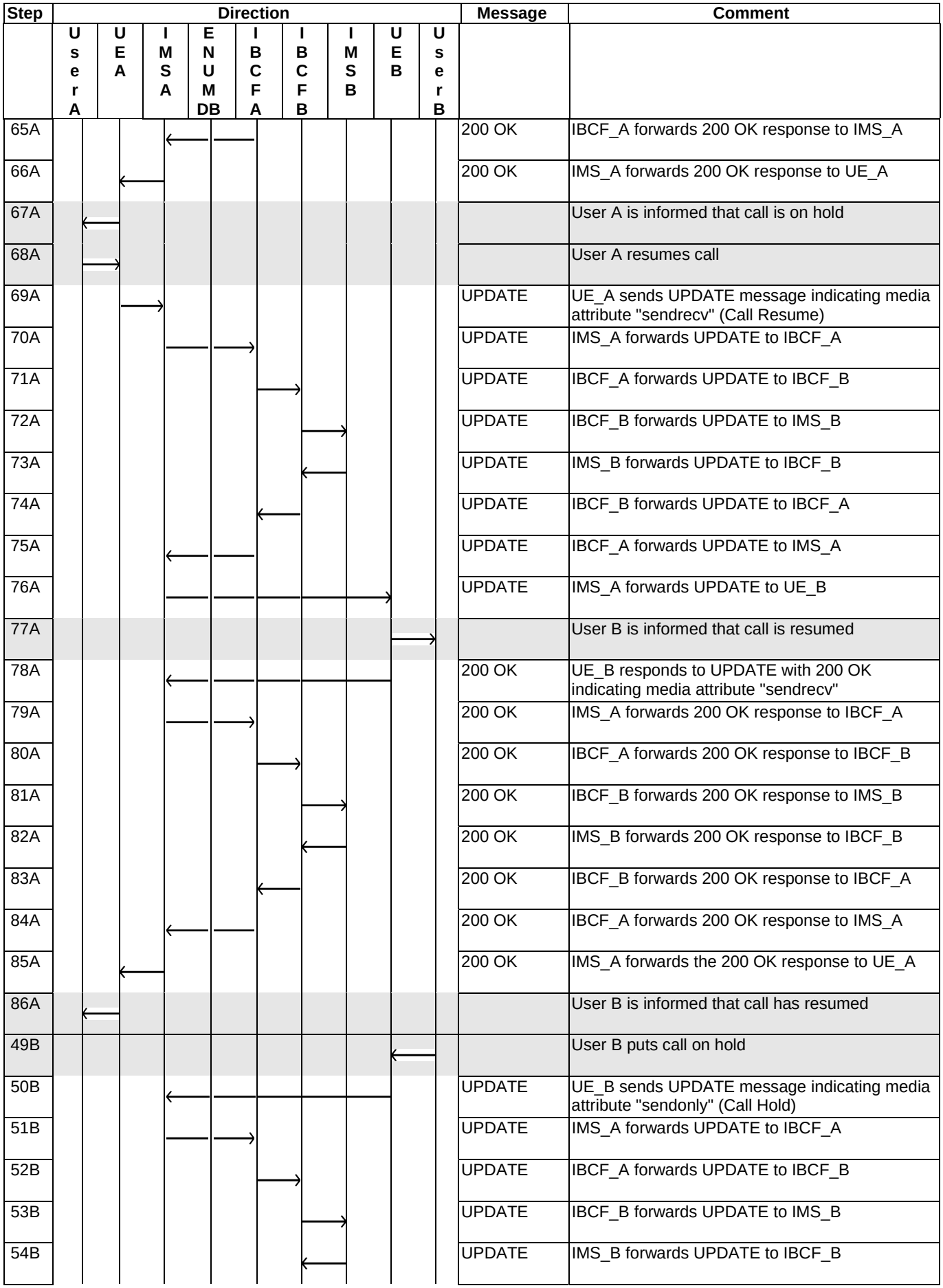
4.4.3.2.3 UC_04_R: SIP Call Flow "call hold and resume" using UPDATE with CF_ROAM_CALL

The expected call flow sequence is:

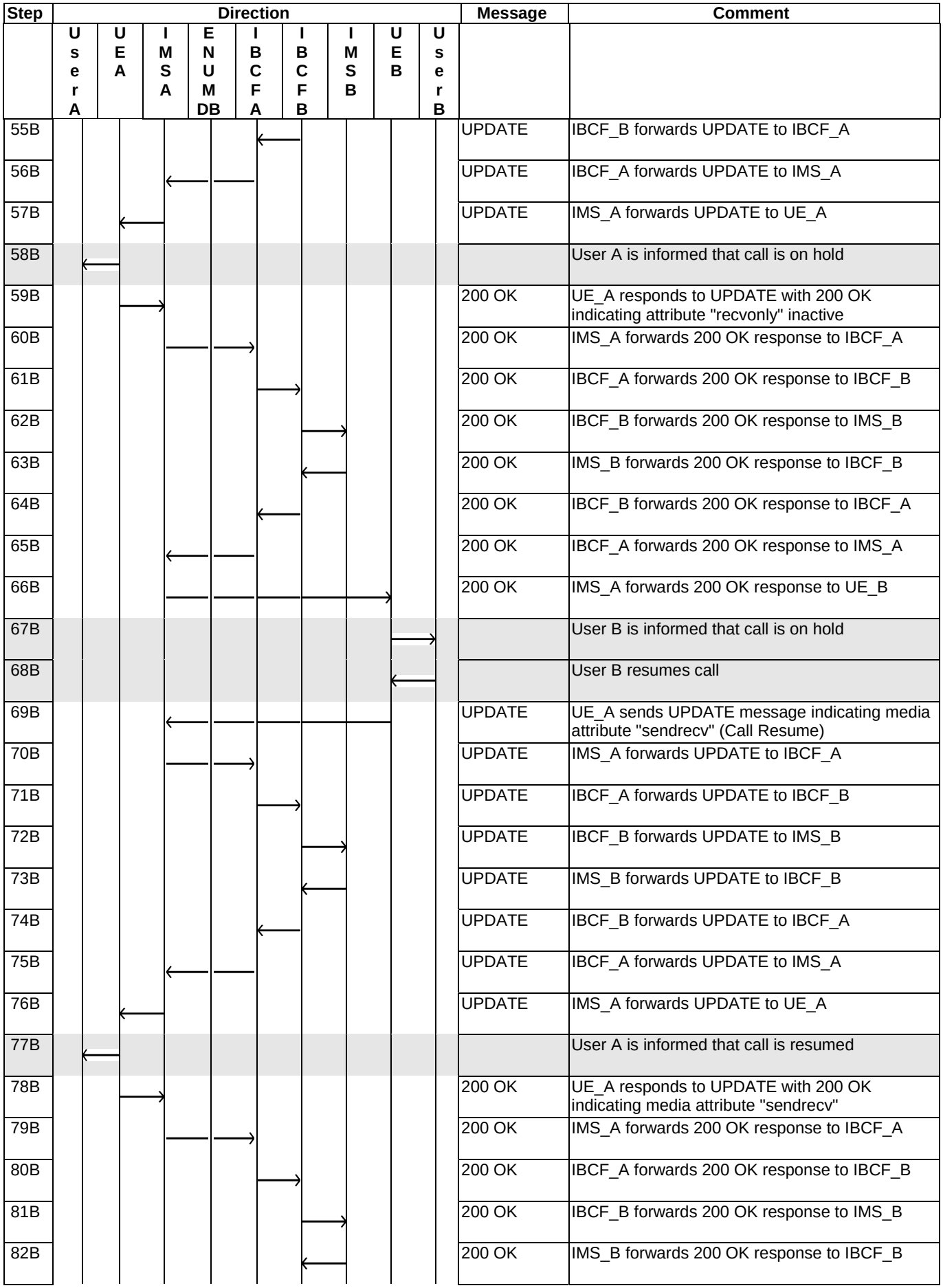
Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
1	→										User A calls User B
2		→								INVITE	UE_A sends INVITE with the first SDP offer indicating all desired medias and codecs that UE_A supports
3		←								100 Trying	IMS_A responds with a 100 Trying provisional response
4			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			—	→						INVITE	IMS_A forwards INVITE to IBCF_A
7			←	—						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B

Step	Direction										Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B			
9						←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10							→				INVITE	IBCF_B forwards INVITE to IMS_B
11							←				100 Trying	IMS_B responds with a 100 Trying provisional response
12							←				INVITE	IMS_B forwards INVITE to IBCF_B
13							→				100 Trying	IBCF_B responds with a 100 Trying provisional response
14						←					INVITE	IBCF_B forwards INVITE to IBCF_A
15						→					100 Trying	IBCF_A responds with a 100 Trying provisional response
16				←	—						INVITE	IBCF_A forwards INVITE to IMS_A
17				—	→						100 Trying	IMS_A responds with a 100 Trying provisional response
18				—	—	—	—	→			INVITE	IMS_A forwards 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
21				←	—	—	—	—			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
22				—	→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
23						→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24							→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25							←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
26						←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27				←	—						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28			←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
29		←										User A is informed that UE_B is ringing
30								←				User B answers call
31				←	—	—	—	—			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
32				—	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
33						→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
34							→				200 OK	IBCF_B forwards 200 OK response 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

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
37			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
38		←								200 OK	IMS_A forwards 200 OK response to UE_A
39	←										User A is informed that call has been answered
40		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
41			→							ACK	IMS_A forwards ACK to IBCF_A
42					→					ACK	IBCF_A forwards ACK to IBCF_B
43						→				ACK	IBCF_B forwards ACK to IMS_B
44						←				ACK	IMS_B forwards ACK to IBCF_B
45					←					ACK	IBCF_B forwards ACK to IBCF_A
46			←							ACK	IBCF_A forwards ACK to IMS_A
47			→		→	→	→			ACK	IMS_A forwards ACK to UE_B
48								→			User B is presented that call is in progress
49A	→										User A puts call on hold
50A		→								UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
51A			→		→					UPDATE	IMS_A forwards UPDATE to IBCF_A
52A					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
53A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
54A						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
55A					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
56A			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
57A			→		→	→	→			UPDATE	IMS_A forwards UPDATE to UE_B
58A								→			User B is informed that call is on hold
59A			←							200 OK	UE_B responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
60A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
61A					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
62A						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
64A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A



Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
65A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66A		←								200 OK	IMS_A forwards 200 OK response to UE_A
67A	←										User A is informed that call is on hold
68A	→										User A resumes call
69A		→								UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
70A			→							UPDATE	IMS_A forwards UPDATE to IBCF_A
71A					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
72A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
73A						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
74A					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
75A			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
76A			→		→	→	→			UPDATE	IMS_A forwards UPDATE to UE_B
77A								→			User B is informed that call is resumed
78A			←		←	←	←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
79A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
80A						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
81A							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
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 B is informed that call has resumed
49B								←			User B puts call on hold
50B			←		←	←	←			UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
51B			→		→					UPDATE	IMS_A forwards UPDATE to IBCF_A
52B						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
53B							→			UPDATE	IBCF_B forwards UPDATE to IMS_B
54B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
55B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
56B			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
57B		←								UPDATE	IMS_A forwards UPDATE to UE_A
58B	←										User A is informed that call is on hold
59B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
60B			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
64B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66B			→		→	→	→			200 OK	IMS_A forwards 200 OK response to UE_B
67B								→			User B is informed that call is on hold
68B								←			User B resumes call
69B			←		←	←	←			UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
70B			→		→					UPDATE	IMS_A forwards UPDATE to IBCF_A
71B						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
72B							→			UPDATE	IBCF_B forwards UPDATE to IMS_B
73B							←			UPDATE	IMS_B forwards UPDATE to IBCF_B
74B						←				UPDATE	IBCF_B forwards UPDATE to IBCF_A
75B			←		←					UPDATE	IBCF_A forwards UPDATE to IMS_A
76B		←								UPDATE	IMS_A forwards UPDATE to UE_A
77B	←										User A is informed that call is resumed
78B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
79B			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
80B						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
81B							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
82B							←			200 OK	IMS_B forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
83B						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
84B				←	—					200 OK	IBCF_A forwards 200 OK response to IMS_A
85B				—	—	—	—	→		200 OK	IMS_A forwards the 200 OK response to UE_B
86B											User B is informed that call is resumed
87		→									User A ends call
88			→							BYE	UE_A releases the call with BYE
89				—	→					BYE	IMS_A forwards BYE to IBCF_A
90						→				BYE	IBCF_A forwards BYE to IBCF_B
91							→			BYE	IBCF_B forwards BYE to IMS_B
92							←			BYE	IMS_B forwards BYE to IBCF_B
93						←				BYE	IBCF_B forwards BYE to IBCF_A
94				←	—					BYE	IBCF_A forwards BYE to IMS_A
95				—	—	—	—	→		BYE	IMS_A forwards BYE to UE_B
96								→			User B is informed that call has ended
97				←	—	—	—	—		200 OK	UE_B sends 200 OK for BYE
98				—	→					200 OK	IMS_A forwards the 200 OK response to IBCF_A
99						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
100							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
101							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
102						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
103				←	—					200 OK	IBCF_A forwards 200 OK response to IMS_A
104			←							200 OK	IMS_A forwards the 200 OK response to UE_A
105		←									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 9	Step 12
3	Optional: User A is presented a delivery report	Step 15	Step 21

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

The expected call flow sequence is:

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
4			←							ENUM	ENUM DB sends response 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

4.4.4.3 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	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response 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 IBCF_B
9						←				MESSAGE	IBCF_B sends MESSAGE to IBCF_A
10				←						MESSAGE	IBCF_A sends MESSAGE to IMS_A
11								→		MESSAGE	IMS_A sends MESSAGE to UE_B
12									→		User B is informed about the instant message
13				←						200 OK	UE_B sends 200 OK to IMS_A
14					→					200 OK	IMS_A sends 200 OK to IBCF_A
15						→				200 OK	IBCF_A sends 200 OK to IBCF_B
16							→			200 OK	IBCF_B sends 200 OK to IMS_B
17							←			200 OK	IMS_B sends 200 OK to IBCF_B
18						←				200 OK	IBCF_B sends 200 OK to IBCF_A
19				←						200 OK	IBCF_A sends 200 OK to IMS_A
20		←								200 OK	IMS_A sends 200 OK to UE_A
21	←										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 25

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	Step34

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	ENUM DB	ASA	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						→						ENUM	IMS_A sends query to ENUM DB
5						←						ENUM	ENUM DB sends response to IMS_A
													INVITE triggers the OIR IFC in IMS_A
6							→					INVITE	IMS_A forwards the INVITE to IMS_A AS
7							←					100 Trying	IMS_A AS optionally responds with a 100 Trying provisional
8							←					INVITE	IMS_A AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_A
9							→					100 Trying	IMS_A responds with a 100 Trying provisional response
10								→				**INVITE**	**IMS_A forwards INVITE to IBCF_A**
11								←				100 Trying	IBCF_A responds with a 100 Trying provisional response
12									→			INVITE	**IBCF_A forwards INVITE to IBCF_B**

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	ASA	IBCF A	IBCF B	IMS B	AS B		
13								←				100 Trying	IBCF_B responds with a 100 Trying provisional response
14									→			**INVITE**	**IBCF_B forwards INVITE to IMS_B**
15									←			100 Trying	IMS_B responds with a 100 Trying provisional response
													INVITE triggers the ACR IFC in IMS_B
16										→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
17										←		100 Trying	AS optionally responds with a 100 Trying provisional response
18										←		433 Anonymity	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
19									←			**433 Anonymity Disallowed**	**IMS_B forwards the 433 Anonymity Disallowed to IBCF_B**
20								←				433 Anonymity Disallowed	**IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A**
21					←	→	→					433 Anonymity Disallowed	**IBCF_A forwards the 433 Anonymity Disallowed to IMS_A**
22					→	→						**433 Anonymity Disallowed**	**IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS**
23					←	→						433 Anonymity	IMS_A AS forwards, possibly modified, 433 Anonymity
24		←	→	→	→							433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_A
25	←	→											User A is informed that the call has been rejected due to ACR
26		→	→	→	→							ACK	UE_A sends ACK to IMS_A
27					→	→	→					ACK	IMS_A forwards the ACK to IMS_A AS
28					←	→						ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
29					→	→	→	→				ACK	IMS_A forwards ACK to IBCF_A
30								→	→			ACK	IBCF_A forwards ACK to IBCF_B
31									→	→		ACK	IBCF_B forwards ACK to IMS_B
32										→	→	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	ASA	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
1			→										User B calls User A
2				→								**INVITE**	**UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports**
3				←								100 Trying	IMS_A responds with a 100 Trying provisional response
4					→							**INVITE**	**IMS_A sends INVITE to 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
10									←			ENUM	IMS B sends query to ENUM DB
11									→			ENUM	ENUM DB sends response to IMS B
													INVITE triggers the OIR IFC in IMS_B
12										→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13										←		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
14										←		INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
15										→		100 Trying	IMS_B responds with a 100 Trying provisional response
16								←	←			INVITE	IMS_B forwards INVITE to IBCF_B
17								→	→			100 Trying	IBCF_B 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	IBCF_A forwards INVITE to IMS_A
21					→							100 Trying	IMS_A responds with a 100 Trying provisional response
													INVITE triggers the ACR IFC in IMS_A
22					→							INVITE	IMS_A forwards the INVITE to IMS_A AS
23					←							100 Trying	AS optionally responds with a 100 Trying provisional response
24					←							433 Anonymity Disallowed	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
25					→							433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to IBCF_A

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
26							→					433 Anonymity Disallowed	IBCF_A forwards the 433 Anonymity Disallowed to IBCF_B
27								→	→			433 Anonymity Disallowed	IBCF_B forwards the 433 Anonymity Disallowed to IMS_B
28										→		433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IMS_B AS
29										←		433 Anonymity Disallowed	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
30								←	←			433 Anonymity Disallowed	IMS_B forwards the 433 Anonymity Disallowed to IBCF_B
31							←					433 Anonymity Disallowed	IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A
32					←	←						433 Anonymity Disallowed	IBCF_A forwards the 433 Anonymity Disallowed to IMS_A
33				←								433 Anonymity Disallowed	IMS_A forwards the 433 Anonymity Disallowed to UE_B
34			←										User B is informed that the call has been rejected due to ACR
35				→								ACK	UE_B sends ACK to IMS_A
36					→	→						ACK	IMS_A sends ACK to IBCF_A
37							→					ACK	IBCF_A sends ACK to IBCF_B
38								→	→			ACK	IBCF_B sends ACK to IMS_B
39										→		ACK	IMS_B forwards the ACK to IMS_B AS
40										←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
41								←	←			ACK	IMS_B forwards ACK to IBCF_B
42							←					ACK	IBCF_B forwards ACK to IBCF_A
43					←	←						ACK	IBCF_A forwards ACK to IMS_A
44					→							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 11	Step 19

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	ENUM DB	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
4								←			ENUM	IMS B sends query to ENUM DB
5								→			ENUM	ENUM DB sends response to IMS B
												INVITE triggers the OCB IFC in IMS_B
6									→		INVITE	IMS_B forwards the INVITE to IMS_B AS
7									←		100 Trying	AS optionally responds with a 100 Trying provisional response
8									←		603 Decline	IMS_B AS returns 603 Decline to IMS_B
9				←							603 Decline	IMS_B forwards the 603 Decline to UE_B
11			←									User B is informed that call was declined
12				→	→	→	→	→			ACK	UE_B sends ACK to IMS_B
13									→		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	ENUM DB	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

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
10								←			ENUM	IMS B sends query to ENUM DB
11								→			ENUM	ENUM DB sends response to IMS B
												INVITE triggers the OCB IFC in IMS_B
12									→		INVITE	IMS_B forwards the INVITE to IMS_B AS
13									←		100 Trying	AS optionally responds with a 100 Trying provisional response
14									←		603 Decline	IMS_B AS returns 603 Decline to IMS_B
15							←	—			603 Decline	IMS_B forwards the 603 Decline to IBCF_B
16						←					603 Decline	IBCF_B forwards the 603 Decline to IBCF_A
17					←						603 Decline	IBCF_A forwards the 603 Decline to IMS_A
18		←	—	—							603 Decline	IMS_A forwards the 603 Decline to UE_B
19	←											User B is informed that call was declined
20		→	—	→							ACK	UE_B sends ACK to IMS_A
21					→						ACK	IMS_A forwards ACK to IBCF_A
22						→					ACK	IBCF_A forwards ACL to IBCF_B
23							—	→			ACK	IBCF_B forwards ACK to IMS_B
24									→		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.

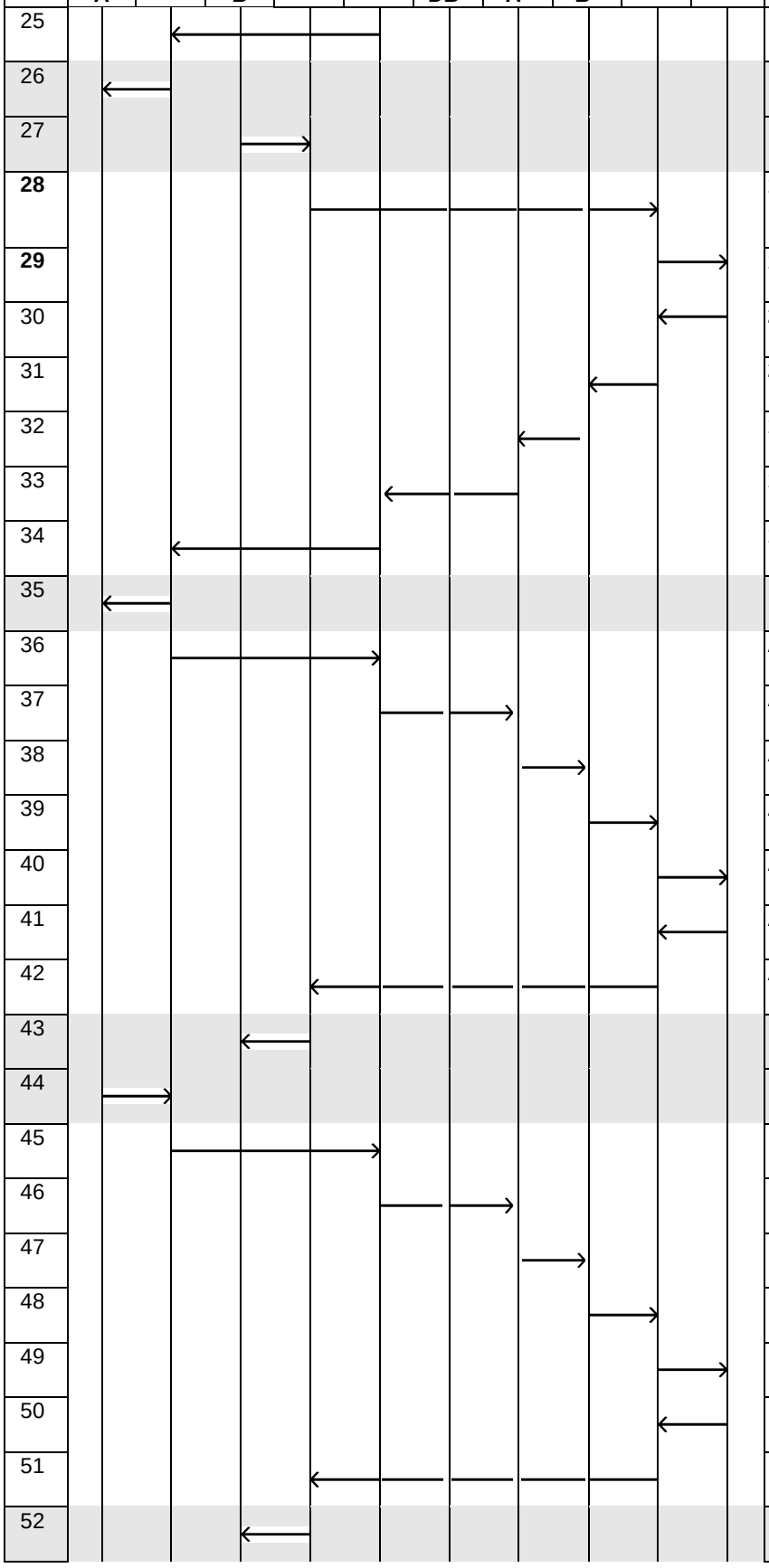
The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

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 18	Step 24
3	User A is informed that UE_B is ringing	Step 26	Step 35
4	User B answers call	Step 27	Step 36
5	User A is informed that call has been answered	Step 35	Step 47
6	User B is informed that the call is established	Step 43	Step 58
7	User A ends call	Step 44	Step 59
8	User B is informed that call has ended	Step 52	Step 70
9	User A is informed that call has ended	Step 60	Step 81

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	ENUM DB	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					→						ENUM	IMS_A sends query to ENUM DB
5					←						ENUM	ENUM DB sends response to IMS
6					→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7					←	←					**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
8							→				**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
9							←				**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
10								→			**INVITE**	**IBCF_B forwards INVITE to IMS_B**
11								←			100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the OIP IFC in IMS_B
12									→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13									←		100 Trying	AS optionally responds with a 100 Trying provisional response
14									←		INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
15									→		100 Trying	IMS_B responds with a 100 Trying provisional response
16				←	←	←	←	←			INVITE	IMS_B forwards the 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, User A's identity is displayed
19				→	→	→	→	→			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20									→		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
21									←		180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
22								←			180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
23							←				180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
24					←	←					180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A



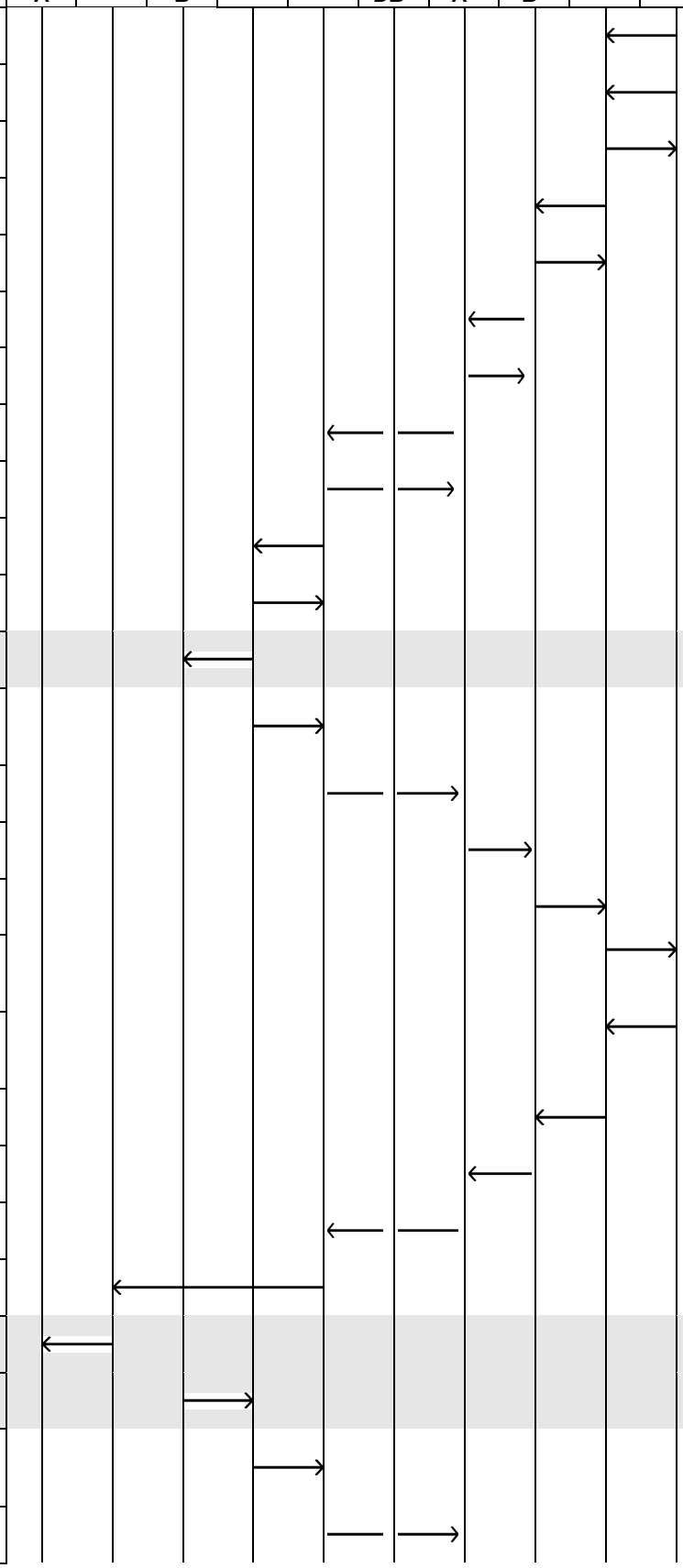
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
25		←			←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
26	←											User A is informed that UE_B is ringing
27			→	→								User B answers call
28				→	→	→	→	→			200 OK	UE_B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

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
53											200 OK	UE_B sends 200 OK for BYE
54											200 OK	IMS_B forwards 200 OK response to IMS_B AS
55											200 OK	IMS_B AS forwards 200 OK response to IMS_B
56											200 OK	IMS_B forwards 200 OK response to IBCF_B
57											200 OK	IBCF_B forwards 200 OK response to IBCF_A
58											200 OK	IBCF_A forwards 200 OK response to IMS_A
59											200 OK	IMS_A forwards 200 OK response to UE_A
60												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	UEA	User B	UEB	IMSA	ENUMDB	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											ENUM	IMS_A sends query to ENUM DB
5											ENUM	ENUM DB sends response to IMS_A
6											**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7											**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
8											**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
9											**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
10											**INVITE**	**IBCF_B forwards INVITE to IMS_B**
11											100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the OIP IFC in IMS_B
12											**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**



Step	Message	Comment
13	100 Trying	AS optionally responds with a 100 Trying provisional response
14	INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
15	100 Trying	IMS_B responds with a 100 Trying provisional response
16	INVITE	IMS_B forwards the INVITE to IBCF_B
17	100 Trying	IBCF_B 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	IBCF_A forwards the INVITE to IMS_A
21	100 Trying	IMS_A responds with a 100 Trying provisional response
22	INVITE	IMS_A forwards the INVITE to UE_B
23	100 Trying	UE_B optionally responds with a 100 Trying provisional response
24		User B is informed of incoming call of User A, User A's identity is displayed
25	180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
26	180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
27	180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
28	180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
29	180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
30	180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
31	180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
32	180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
33	180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
34	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
35		User A is informed that UE_B is ringing
36		User B answers call
37	200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
38	200 OK	IMS_A forwards 200 OK response to IBCF_A

Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
39							→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
40								→			200 OK	IBCF_B forwards 200 OK response to IMS_B
41									→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
42									←		**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
43								←			**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
44							←				200 OK	IBCF_B forwards the 180 Ringing response to IBCF_A
45					←						200 OK	IBCF_A forwards the 180 Ringing response to IMS_A
46		←									200 OK	IMS_A forwards the 200 OK response to UE_A
47	←											User A is informed that call has been answered
48		→			→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
49						→					ACK	IMS_A forwards ACK to IBCF_A
50							→				ACK	IBCF_A forwards ACK to IBCF_B
51								→			ACK	IBCF_B forwards ACK to IMS_B
52									→		ACK	IMS_B forwards ACK to IMS_B AS
53									←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
54								←			ACK	IMS_B forwards ACK to IBCF_B
55							←				ACK	IBCF_B forwards ACK to IBCF_A
56					←						ACK	IBCF_A forwards ACK to IMS_A
57				←							ACK	IMS_A forwards ACK to UE_B
58			←									User B is informed that the call is established
59	→											User A ends call
60		→			→						BYE	UE_A releases the call with BYE
61						→					BYE	IMS_A forwards BYE to IBCF_A
62							→				BYE	IBCF_A forwards BYE to IBCF_B
63								→			BYE	IBCF_B forwards BYE to IMS_B
64									→		BYE	IMS_B forwards BYE to IMS_B AS
65									←		BYE	IMS_B AS forwards, possibly modified, BYE to IMS_B

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
66								←			BYE	IMS_B forwards BYE to IBCF_B
67							←				BYE	IBCF_B forwards BYE to IBCF_A
68					←	—					BYE	IBCF_A forwards BYE to IMS_A
69				←							BYE	IMS_A forwards BYE to UE_B
70			←									User B is informed that call has ended
71				→							200 OK	UE_B sends 200 OK for BYE
72					→	—					200 OK	IMS_A forwards 200 OK to IBCF_A
73							→				200 OK	IBCF_A forwards 200 OK to IBCF_B
74								→			200 OK	IBCF_B forwards 200 OK to IMS_B
75									→		200 OK	IMS_B forwards 200 OK to IMS_B AS
76									←		200 OK	IMS_B AS forwards 200 OK response to IMS_B
77								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
78							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
79					←	—					200 OK	IBCF_A forwards 200 OK response to IMS_A
80		←									200 OK	IMS_A forwards 200 OK response to UE_A
81	←											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.

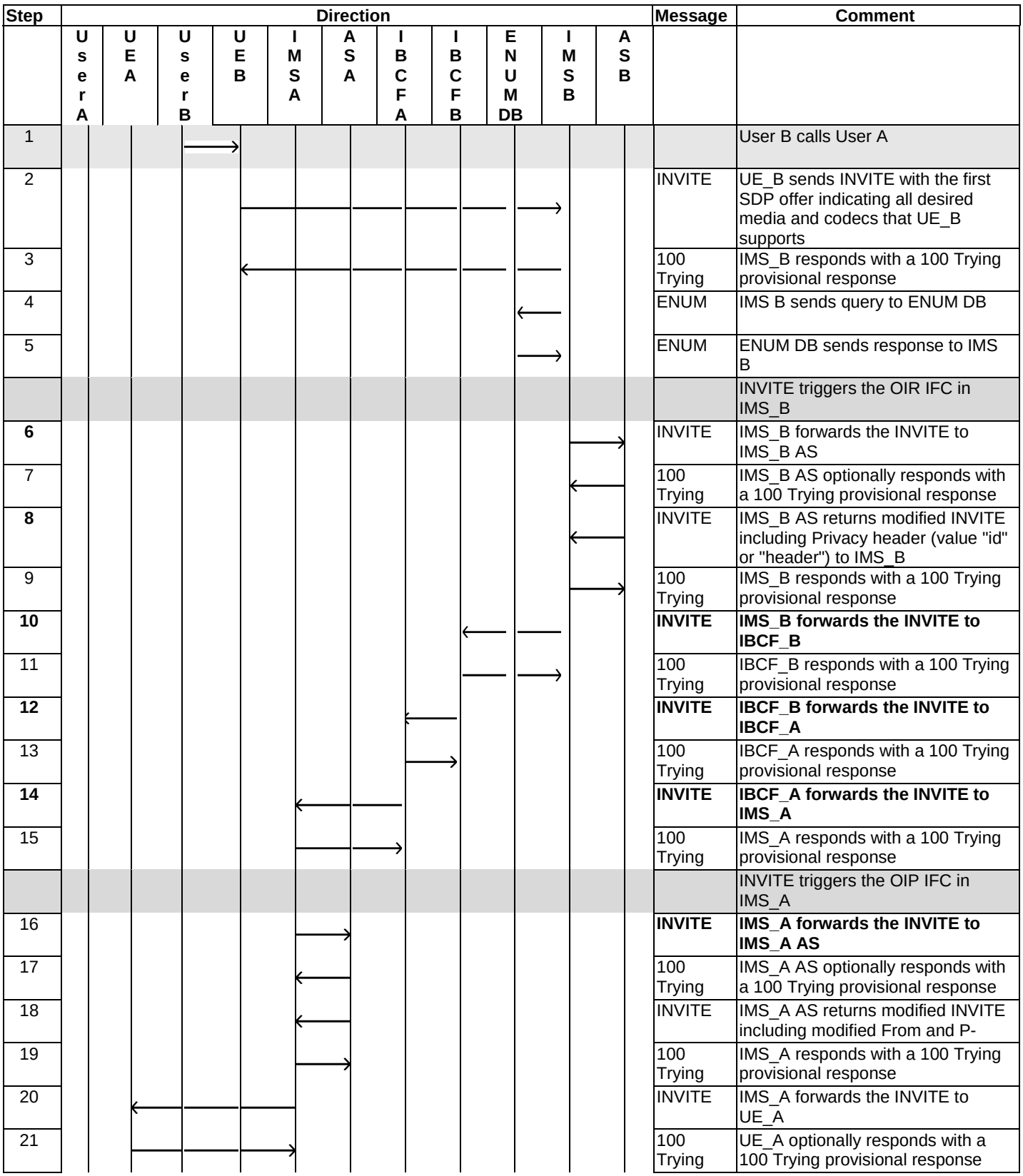
The test sequence typically associated with this use case is as follows (CFW step numbers refer the call flow step numbering):

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 22	Step 28
3	User B is informed that UE_A is ringing	Step 32	Step 41
4	User A answers call	Step 33	Step 42
5	User B is informed that call has been answered	Step 43	Step 55
6	User A is informed that the call is established	Step 51	Step 66
7	User A ends call	Step 52	Step 67
8	User B is informed that call has ended	Step 62	Step 80

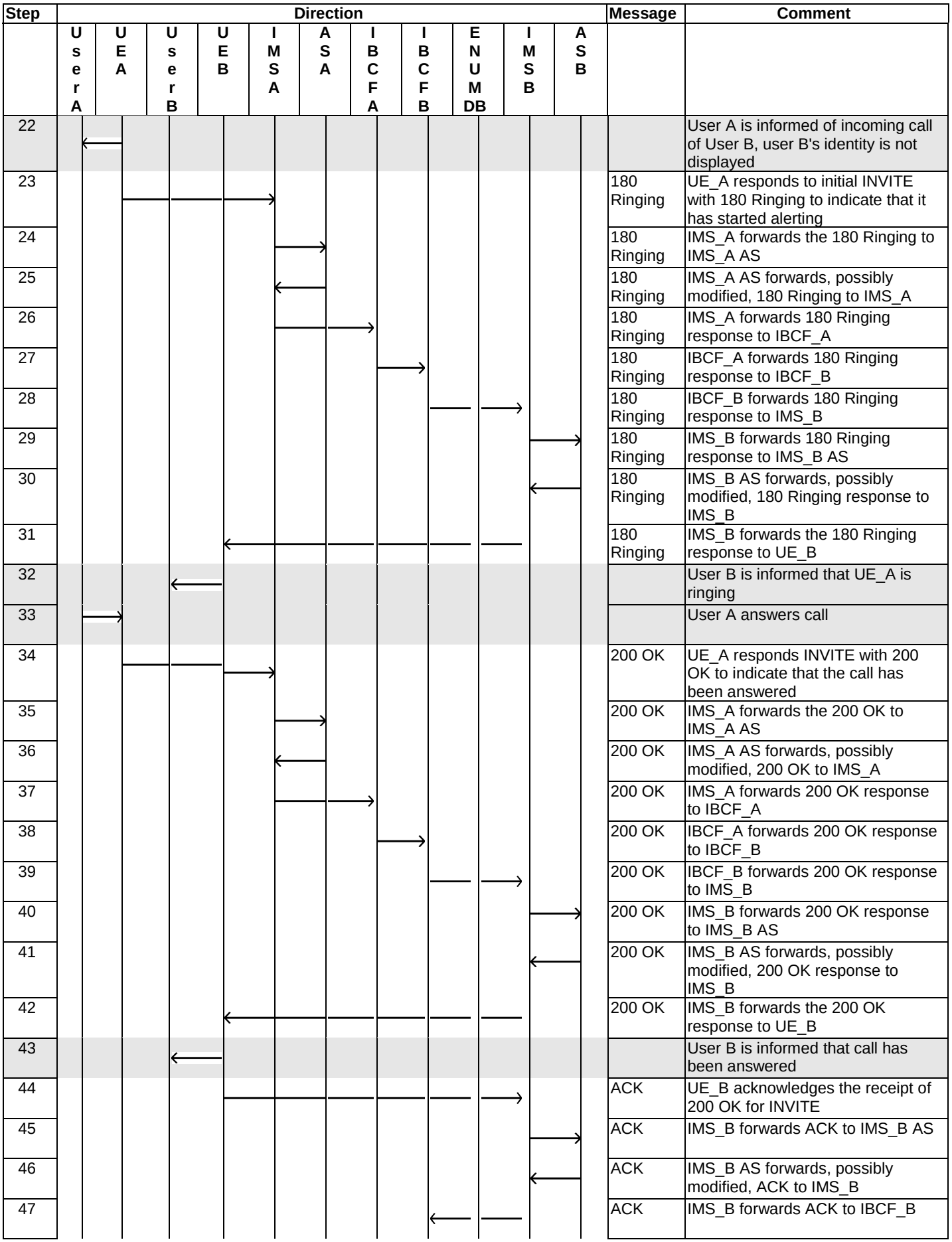
9	User A is informed that call has ended	Step 70	Step 91

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
1	User B → UE B		User B calls User A
2	UE B → IMS A → AS A → IBCF A → IBCF B → ENUM DB → IMS B	INVITE	UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports
3	IMS B → ENUM DB → IBCF B → IBCF A → AS A → IMS A → UE B	100 Trying	IMS_B responds with a 100 Trying provisional response
4	IMS B → ENUM DB	ENUM	IMS B sends query to ENUM DB
5	ENUM DB → IMS B	ENUM	ENUM DB sends response to IMS B
			INVITE triggers the OIR IFC in IMS_B
6	IMS B → AS B	INVITE	IMS_B forwards the INVITE to IMS_B AS
7	AS B → IMS B	100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
8	AS B → IMS B	INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
9	IMS B → AS B	100 Trying	IMS_B responds with a 100 Trying provisional response
10	IMS B → ENUM DB → IBCF B	**INVITE**	**IMS_B forwards the INVITE to IBCF_B**
11	IBCF B → ENUM DB → IMS B	100 Trying	IBCF_B responds with a 100 Trying provisional response
12	IBCF B → IBCF A	**INVITE**	**IBCF_B forwards the INVITE to IBCF_A**
13	IBCF A → IBCF B	100 Trying	IBCF_A responds with a 100 Trying provisional response
14	IMS A → AS A → IBCF A	**INVITE**	**IBCF_A forwards the INVITE to IMS_A**
15	IBCF A → AS A → IMS A	100 Trying	IMS_A responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_A
16	IMS A → AS A	**INVITE**	**IMS_A forwards the INVITE to IMS_A AS**
17	AS A → IMS A	100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
18	AS A → IMS A	INVITE	IMS_A AS returns modified INVITE including modified From and P-
19	IMS A → AS A	100 Trying	IMS_A responds with a 100 Trying provisional response
20	IMS A → UE B → UE A	INVITE	IMS_A forwards the INVITE to UE_A
21	UE A → UE B → UE B	100 Trying	UE_A optionally responds with a 100 Trying provisional response



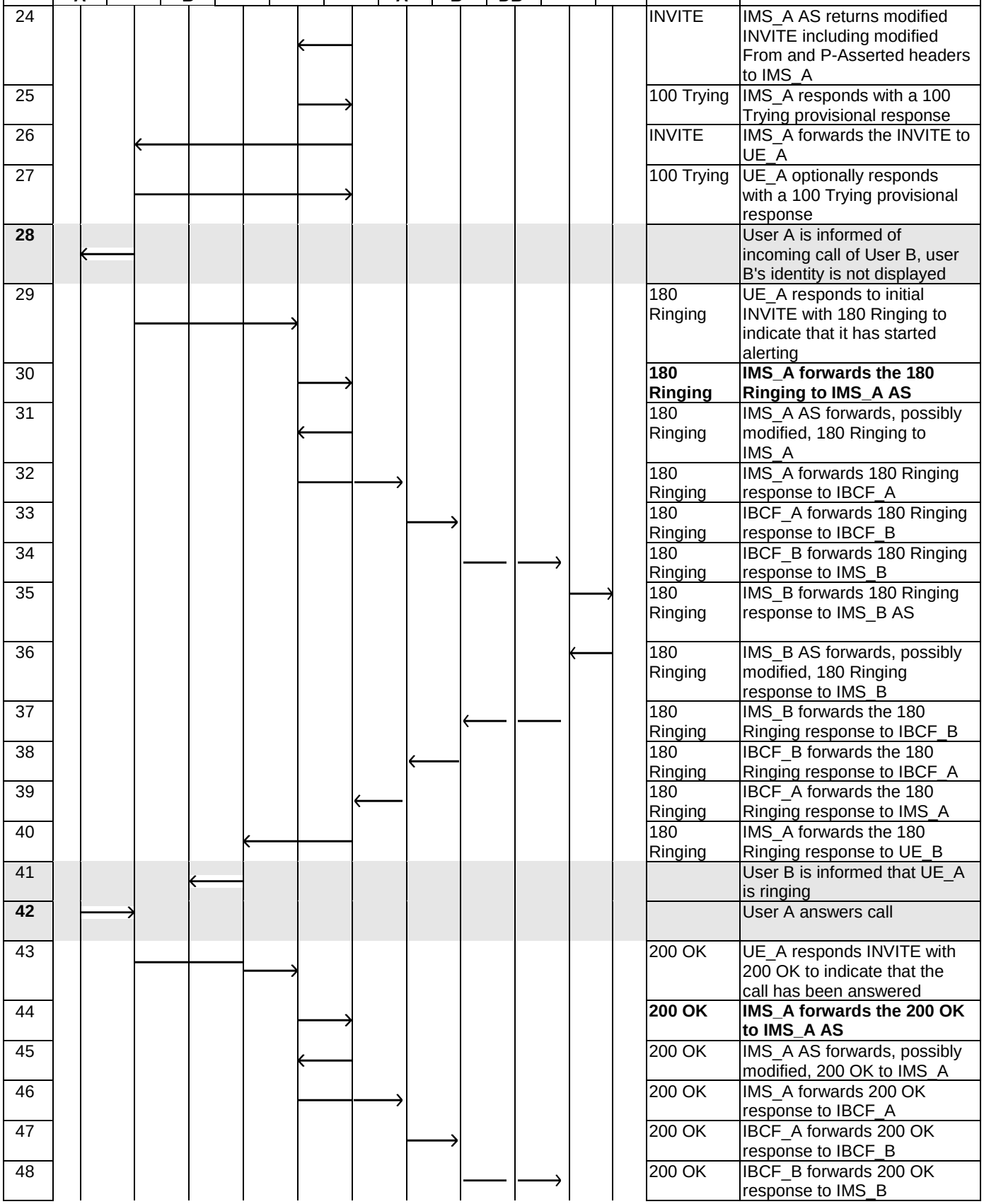
Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
22	←												User A is informed of incoming call of User B, user B's identity is not displayed
23		→	→	→								180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
24					→	→						180 Ringing	IMS_A forwards the 180 Ringing to IMS_A AS
25					←	←						180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
26							→	→				180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
27												180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
28												180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
29												180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
30												180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
31												180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
32			←										User B is informed that UE_A is ringing
33	→												User A answers call
34		→	→	→								200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
35					→	→						200 OK	IMS_A forwards the 200 OK to IMS_A AS
36					←	←						200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
37							→	→				200 OK	IMS_A forwards 200 OK response to IBCF_A
38												200 OK	IBCF_A forwards 200 OK response to IBCF_B
39												200 OK	IBCF_B forwards 200 OK response to IMS_B
40												200 OK	IMS_B forwards 200 OK response to IMS_B AS
41												200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
42												200 OK	IMS_B forwards the 200 OK response to UE_B
43			←										User B is informed that call has been answered
44				→	→	→	→	→	→	→		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
45											→	ACK	IMS_B forwards ACK to IMS_B AS
46											←	ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
47									←	←		ACK	IMS_B forwards ACK to IBCF_B

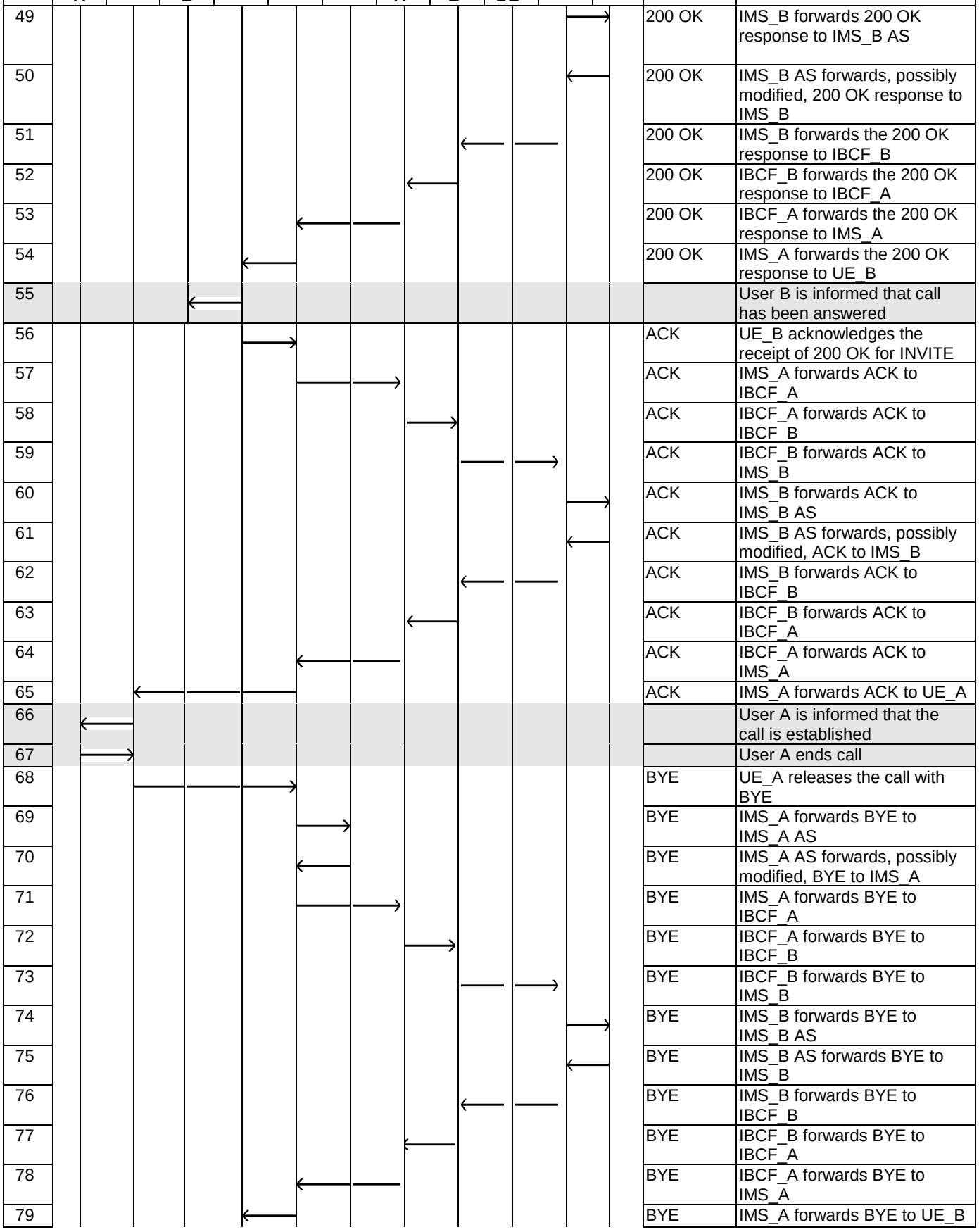
Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
48							←					ACK	IBCF_B forwards ACK to IBCF_A
49					←							ACK	IBCF_A forwards ACK to IMS_A
50		←										ACK	IMS_A forwards ACK to UE_A
51	←												User A is informed that the call is established
52	→												User A ends call
53		→			→							BYE	UE_A releases the call with BYE
54					→							BYE	IMS_A forwards BYE to IMS_A AS
55					←							BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
56					→							BYE	IMS_A forwards BYE to IBCF_A
57								→				BYE	IBCF_A forwards BYE to IBCF_B
58									→	→		BYE	IBCF_B forwards BYE to IMS_B
59											→	BYE	IMS_B forwards BYE to IMS_B AS
60											←	BYE	IMS_B AS forwards BYE to IMS_B
61				←								BYE	IMS_B forwards BYE to UE_B
62			←										User B is informed that call has ended
63									→	→		200 OK	UE_B sends 200 OK for BYE
64											→	200 OK	IMS_B forwards 200 OK response to IMS_B AS
65											←	200 OK	IMS_B AS forwards, possibly modified, 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
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

4.4.8.3 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 / ENUM DB / 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	IMS A → UE B	100 Trying	IMS_A responds with a 100 Trying provisional response
4	IMS A → AS A → IBCF A	**INVITE**	**IMS_A forwards INVITE to IBCF_A**
5	IBCF A → IMS 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 B → IBCF A	100 Trying	IBCF_B responds with a 100 Trying provisional response
8	IBCF B → ENUM DB → IMS B	**INVITE**	**IBCF_B forwards INVITE to IMS_B**
9	IBCF B → ENUM DB	100 Trying	IMS_B responds with a 100 Trying provisional response
10	ENUM DB → IMS B	ENUM	IMS B sends query to ENUM DB
11	ENUM DB → IMS B	ENUM	ENUM DB sends response to IMS B
			INVITE triggers the OIR IFC in IMS_B
12	IMS B → AS B	**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13	AS B → IMS B	100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
14	AS B → IMS B	INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
15	IMS B → AS B	100 Trying	IMS_B responds with a 100 Trying provisional response
16	IMS B → ENUM DB → IBCF B	INVITE	IMS_B forwards the INVITE to IBCF_B
17	ENUM DB → IBCF B	100 Trying	IBCF_B responds with a 100 Trying provisional response
18	IBCF B → IBCF A	INVITE	IBCF_B forwards the INVITE to IBCF_A
19	IBCF A → IBCF B	100 Trying	IBCF_A responds with a 100 Trying provisional response
20	IBCF A → AS A → IMS A	INVITE	IMS_B forwards the INVITE to IMS_A
21	IMS A → AS A	100 Trying	IMS_A responds with a 100 Trying provisional response
			INVITE triggers the OIP IFC in IMS_A
22	IMS A → AS A	INVITE	IMS_A forwards the INVITE to IMS_A AS
23	AS A → IMS A	100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response


Step
Direction
User A
UE A
User B
UE B
IMS A
AS A
IBCF A
IBCF B
ENUM DB
IMS B
AS B
Message
Comment
24 INVITE IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
25 100 Trying IMS_A responds with a 100 Trying provisional response
26 INVITE IMS_A forwards the INVITE to UE_A
27 100 Trying UE_A optionally responds with a 100 Trying provisional response
28 User A is informed of incoming call of User B, user B's identity is not displayed
29 180 Ringing UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
30 180 Ringing IMS_A forwards the 180 Ringing to IMS_A AS
31 180 Ringing IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
32 180 Ringing IMS_A forwards 180 Ringing response to IBCF_A
33 180 Ringing IBCF_A forwards 180 Ringing response to IBCF_B
34 180 Ringing IBCF_B forwards 180 Ringing response to IMS_B
35 180 Ringing IMS_B forwards 180 Ringing response to IMS_B AS
36 180 Ringing IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
37 180 Ringing IMS_B forwards the 180 Ringing response to IBCF_B
38 180 Ringing IBCF_B forwards the 180 Ringing response to IBCF_A
39 180 Ringing IBCF_A forwards the 180 Ringing response to IMS_A
40 180 Ringing IMS_A forwards the 180 Ringing response to UE_B
41 User B is informed that UE_A is ringing
42 User A answers call
43 200 OK UE_A responds INVITE with 200 OK to indicate that the call has been answered
44 200 OK IMS_A forwards the 200 OK to IMS_A AS
45 200 OK IMS_A AS forwards, possibly modified, 200 OK to IMS_A
46 200 OK IMS_A forwards 200 OK response to IBCF_A
47 200 OK IBCF_A forwards 200 OK response to IBCF_B
48 200 OK IBCF_B forwards 200 OK response to IMS_B



Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
49										→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
50										←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
51								←	—			200 OK	IMS_B forwards the 200 OK response to IBCF_B
52							←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
53					←	—						200 OK	IBCF_A forwards the 200 OK response to IMS_A
54				←								200 OK	IMS_A forwards the 200 OK response to UE_B
55			←										User B is informed that call has been answered
56				→								ACK	UE_B acknowledges the receipt of 200 OK for INVITE
57					→	→						ACK	IMS_A forwards ACK to IBCF_A
58							→					ACK	IBCF_A forwards ACK to IBCF_B
59								→	→			ACK	IBCF_B forwards ACK to IMS_B
60										→		ACK	IMS_B forwards ACK to IMS_B AS
61										←		ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
62								←	—			ACK	IMS_B forwards ACK to IBCF_B
63							←					ACK	IBCF_B forwards ACK to IBCF_A
64					←	—						ACK	IBCF_A forwards ACK to IMS_A
65		←	—	—								ACK	IMS_A forwards ACK to UE_A
66	←												User A is informed that the call is established
67	→												User A ends call
68		→	—	—								BYE	UE_A releases the call with BYE
69					→	→						BYE	IMS_A forwards BYE to IMS_A AS
70					←	—						BYE	IMS_A AS forwards, possibly modified, BYE to IMS_A
71					→	→						BYE	IMS_A forwards BYE to IBCF_A
72							→					BYE	IBCF_A forwards BYE to IBCF_B
73								→	→			BYE	IBCF_B forwards BYE to IMS_B
74										→		BYE	IMS_B forwards BYE to IMS_B AS
75										←		BYE	IMS_B AS forwards BYE to IMS_B
76								←	—			BYE	IMS_B forwards BYE to IBCF_B
77							←					BYE	IBCF_B forwards BYE to IBCF_A
78					←	—						BYE	IBCF_A forwards BYE to IMS_A
79				←								BYE	IMS_A forwards BYE to UE_B

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
80			←										User B is informed that call has ended
81				→								200 OK	UE_B sends 200 OK for BYE
82					→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
83							→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
84								→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
85										→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
86										←		200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
87								←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
88							←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
89					←	—						200 OK	IBCF_A forwards 200 OK response to IMS_A
90		←	—	—								200 OK	IMS_A forwards 200 OK response to UE_A
91	←												User A is informed that call has ended

4.4.9 Supplementary Service HOLD

4.4.9.1 Description

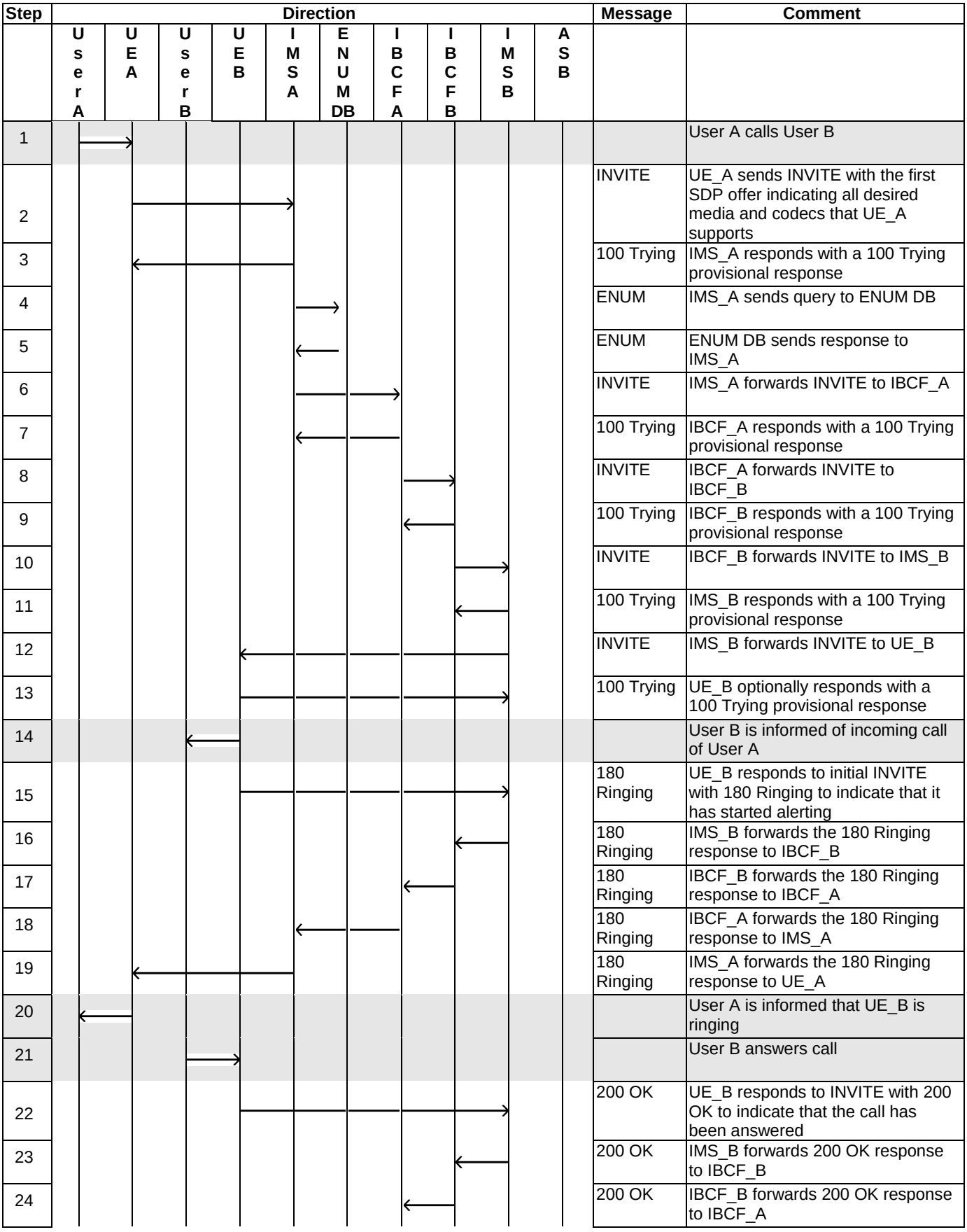
UE_A places an IMS VoIP call to UE_B which places the call on HOLD. UE_A will be notified by the AS that the call is on hold. UE_B will resume the call, and UE_A will be informed by the AS that the call is resumed.

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

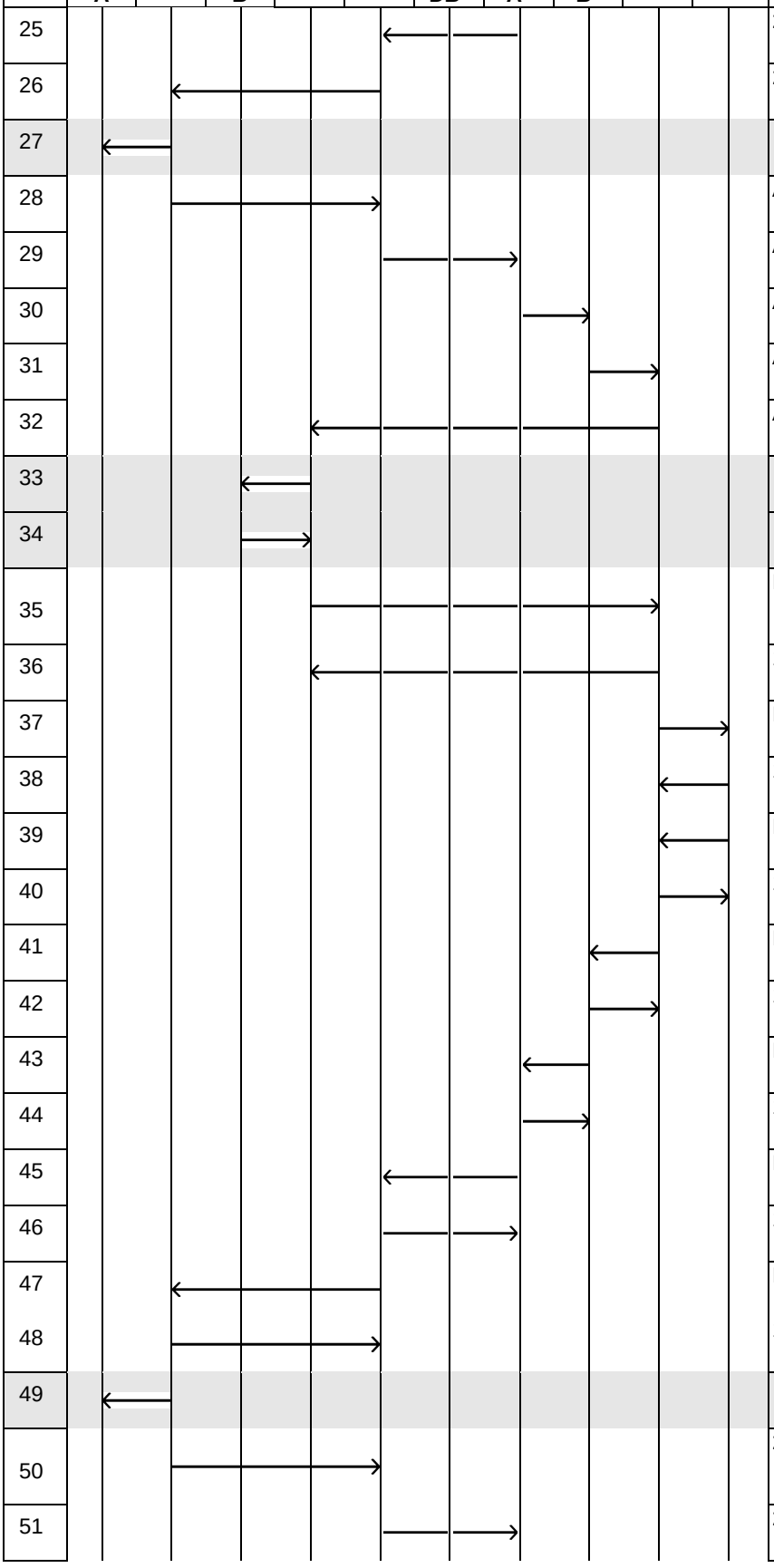
Step	Action	CF_INT_AS	CF_ROAM_AS
1	User A calls User B	1	1
2	User B is informed of incoming call of User A	14	20
3	User A is informed that UE_B is ringing	20	29
4	User B answers call	21	30
5	User A is informed that call has been answered	27	39
6	User B is informed that call is established	33	48
7	User B puts call on hold	34	49
8	User A is informed that call on hold with AS tone	49	70
9	User B is informed that call on hold	57	81
10	User B resumes call	65	92
11	User B is informed that call is resumed	87	123
12	User A is informed that call is resumed	95	134
13	User A ends call	96	135
14	User B is informed that call has ended	102	144
15	User A is informed that call has ended	108	153

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

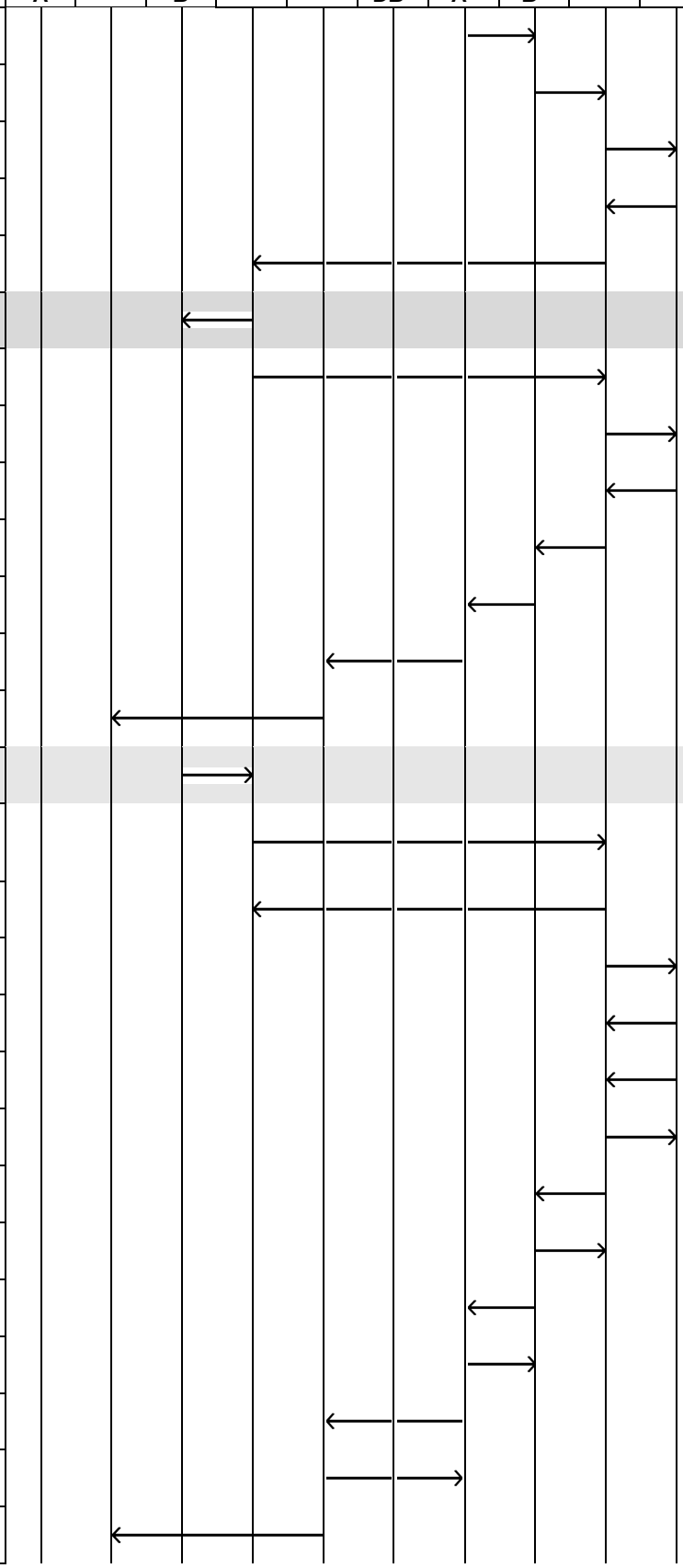
The expected call flow sequence is:



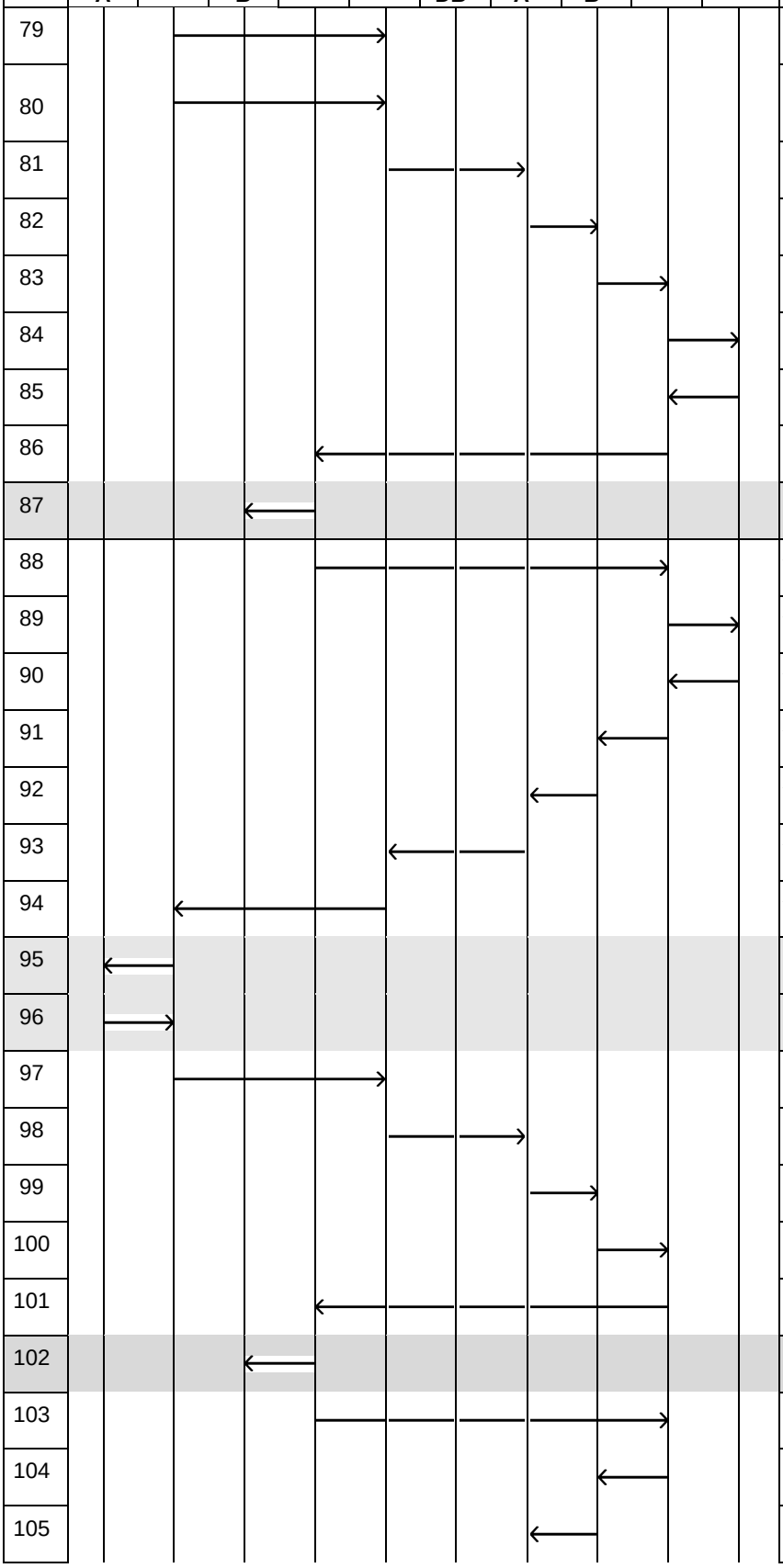
Step	Direction	Message	Comment
1			User A calls User B
2		INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		100 Trying	IMS_A responds with a 100 Trying provisional response
4		ENUM	IMS_A sends query to ENUM DB
5		ENUM	ENUM DB sends response to IMS_A
6		INVITE	IMS_A forwards INVITE to IBCF_A
7		100 Trying	IBCF_A responds with a 100 Trying provisional response
8		INVITE	IBCF_A forwards INVITE to IBCF_B
9		100 Trying	IBCF_B responds with a 100 Trying provisional response
10		INVITE	IBCF_B forwards INVITE to IMS_B
11		100 Trying	IMS_B responds with a 100 Trying provisional response
12		INVITE	IMS_B forwards INVITE to UE_B
13		100 Trying	UE_B optionally responds with a 100 Trying provisional response
14			User B is informed of incoming call of User A
15		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16		180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
17		180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
18		180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
19		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20			User A is informed that UE_B is ringing
21			User B answers call
22		200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
23		200 OK	IMS_B forwards 200 OK response to IBCF_B
24		200 OK	IBCF_B forwards 200 OK response to IBCF_A



Step	Message	Comment
25	200 OK	IBCF_A forwards 200 OK response to IMS_A
26	200 OK	IMS_A forwards the 200 OK response to UE_A
27		User A is informed that call has been answered
28	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
29	ACK	IMS_A forwards ACK to IBCF_A
30	ACK	IBCF_A forwards ACK to IBCF_B
31	ACK	IBCF_B forwards ACK to IMS_B
32	ACK	IMS_B forwards ACK to UE_B
33		User B is informed that call is established
34		User B puts call on hold
35	INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
36	100 Trying	IMS_B responds with a 100 Trying provisional response
37	INVITE	IMS_B sends reINVITE to AS_B
38	100 Trying	AS_B optionally responds with a 100 Trying provisional response
39	INVITE	AS_B sends reINVITE to IMS_B
40	100 Trying	IMS_B responds with a 100 Trying provisional response
41	INVITE	IMS_B forwards reINVITE to IBCF_B
42	100 Trying	IBCF_B responds with a 100 Trying provisional response
43	INVITE	IBCF_B forwards reINVITE to IBCF_A
44	100 Trying	IBCF_A responds with a 100 Trying provisional response
45	INVITE	IBCF_A forwards reINVITE to IMS_A
46	100 Trying	IMS_A responds with a 100 Trying provisional response
47	INVITE	IMS_A forwards reINVITE to UE_A
48	100 Trying	UE_A optionally responds with a 100 Trying provisional response
49		User A is informed that call is on hold with AS tone
50	200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
51	200 OK	IMS_A forwards 200 OK response to IBCF_A



Step	Message	Comment
52	200 OK	IBCF_A forwards 200 OK response to IBCF_B
53	200 OK	IBCF_B forwards 200 OK response to IMS_B
54	200 OK	IMS_B forwards 200 OK response to AS_B
55	200 OK	AS_B forwards 200 OK response to IMS_B
56	200 OK	IMS_B forward the 200 OK to UE_B
57		User B is informed that the call is on hold
58	ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
59	ACK	IMS_B forwards ACK to AS_B
60	ACK	AS_B forwards ACK to IMS_B
61	ACK	IMS_B forwards ACK to IBCF_B
62	ACK	IBCF_B forwards ACK to IBCF_A
63	ACK	IBCF_A forwards ACK to IMS_A
64	ACK	IMS_A forwards ACK to UE_A
65		User B resumes call
66	INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
67	100 Trying	IMS_B responds with a 100 Trying provisional response
68	INVITE	IMS_B sends reINVITE to AS_B
69	100 Trying	AS_B optionally responds with a 100 Trying provisional response
70	INVITE	AS_B forwards INVITE to IMS_B
71	100 Trying	IMS_B responds with a 100 Trying provisional response
72	INVITE	IMS_B sends reINVITE to IBCF_B
73	100 Trying	IBCF_B responds with a 100 Trying provisional response
74	INVITE	IBCF_B sends reINVITE to IBCF_A
75	100 Trying	IBCF_A responds with a 100 Trying provisional response
76	INVITE	IBCF_A sends reINVITE to IMS_A
77	100 Trying	IMS_A responds with a 100 Trying provisional response
78	INVITE	IMS_A forwards reINVITE to UE_A



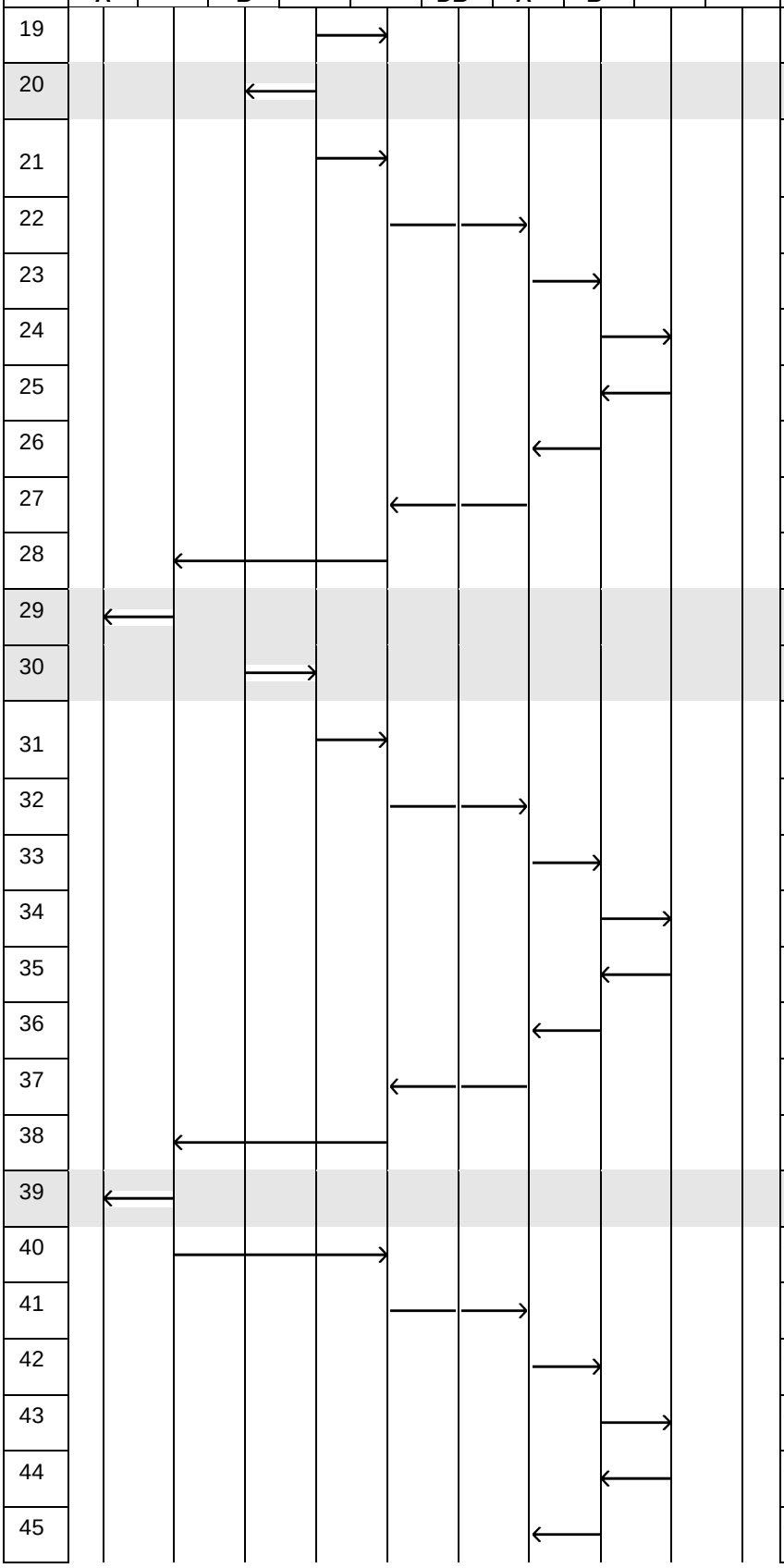
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
79		→		→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
80		→		→							200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
81					→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
82							→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
83								→			200 OK	IBCF_B forwards 200 OK response to IMS_B
84									→		200 OK	IMS_B forwards 200 OK response to AS_B
85									←		200 OK	AS_B forwards the 200 OK for INVITE
86				←	←	←	←	←			200 OK	IMS_B forwards 200 OK to UE_B
87			←									User B is informed that call is resumed
88				→	→	→	→	→			ACK	UE_B sends ACK to IMS_B
89									→		ACK	IMS_B forwards ACK to AS_B
90									←		ACK	AS_B forwards ACK to IMS_B
91								←			ACK	IMS_B forwards ACK to IBCF_B
92							←				ACK	IBCF_B forwards ACK to IBCF_A
93					←	←					ACK	IBCF_A forwards ACK to IMS_A
94		←									ACK	IMS_A forwards ACK to UE_A
95	←											User A is informed that call resumed
96	→											User A ends call
97		→		→							BYE	UE_A releases the call with BYE
98					→	→					BYE	IMS_A forwards BYE to IBCF_A
99							→				BYE	IBCF_A forwards BYE to IBCF_B
100								→			BYE	IBCF_B forwards BYE to IMS_B
101				←	←	←	←	←			BYE	IMS_B forwards BYE to UE_B
102			←									User B is informed that call has ended
103				→	→	→	→	→			200 OK	UE_B sends 200 OK for BYE
104								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
105							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A

Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
106					←						200 OK	IBCF_A forwards 200 OK response to IMS_A
107		←									200 OK	IMS_A forwards the 200 OK response to UE_A
108	←											User A is informed that call has ended

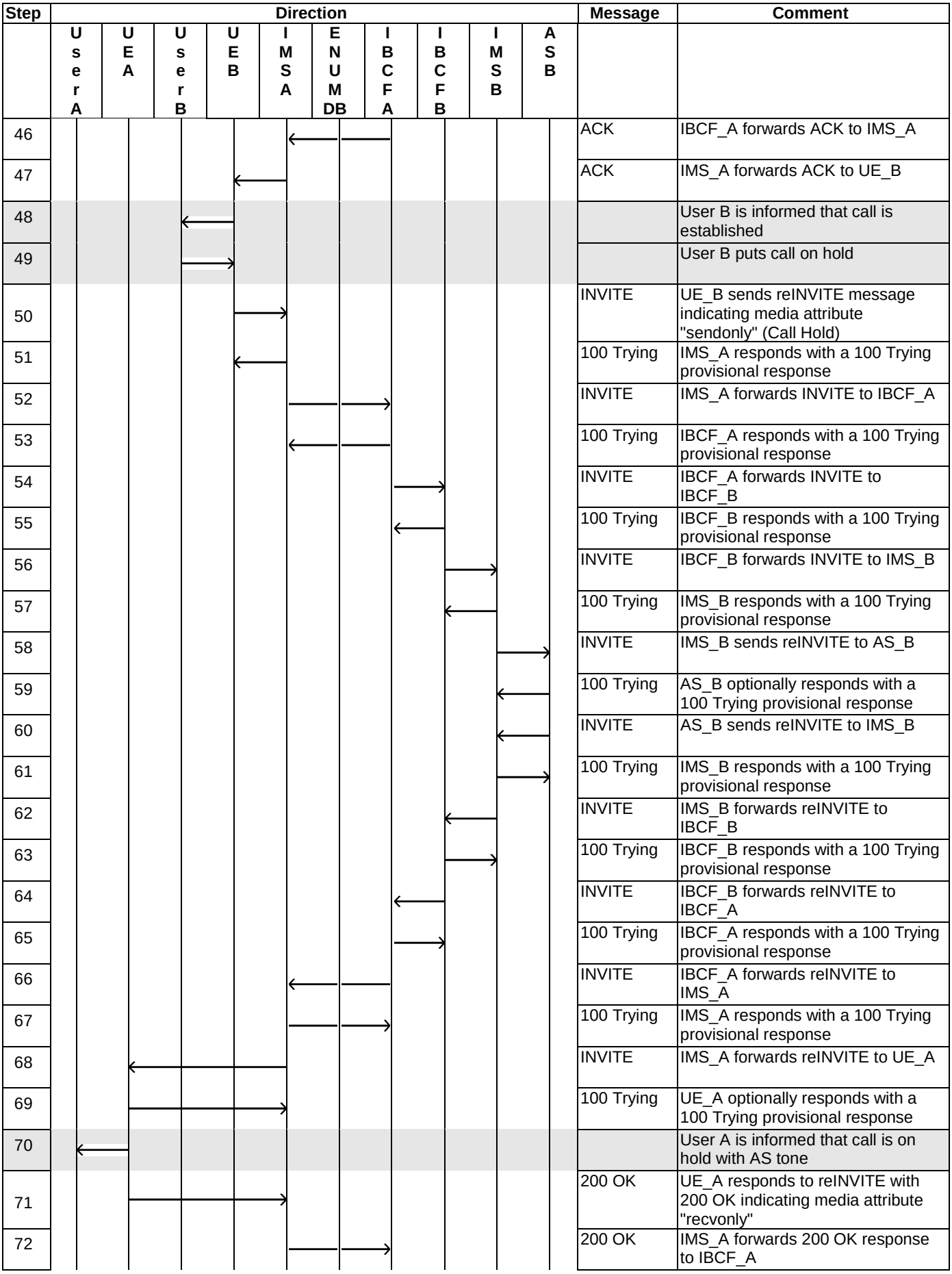
4.4.9.1.2 UC_10_R: SIP Call Flow "call hold and resume with AS tone" using reINVITE with CF_ROAM_AS

The expected call flow sequence is:

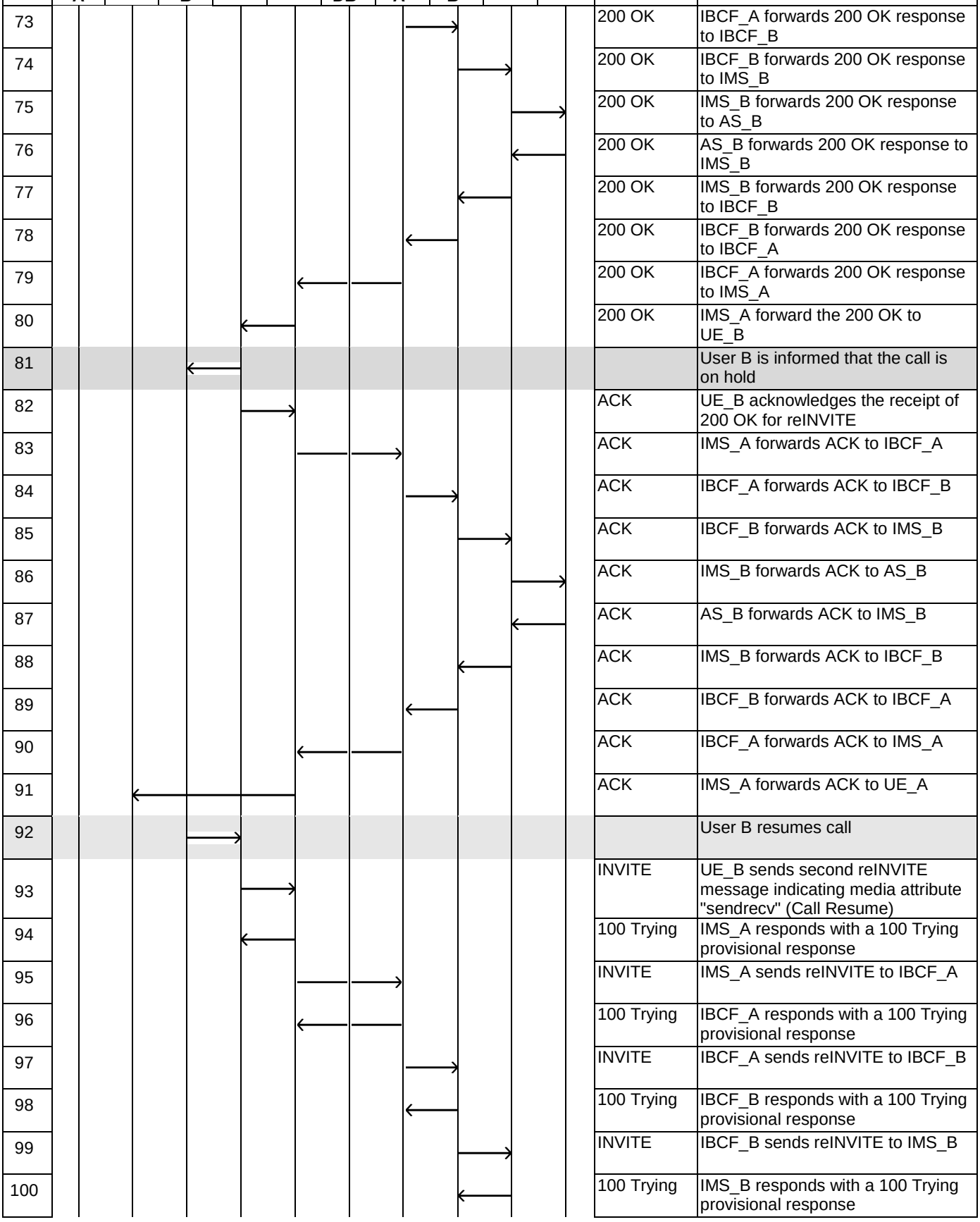
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
1	→											User A calls User B
2		→			→						INVITE	UE_A sends INVITE with the first SDP offer indicating all desired media and codecs that UE_A supports
3		←			←						100 Trying	IMS_A responds with a 100 Trying provisional response
4					→						ENUM	IMS_A sends query to ENUM DB
5					←						ENUM	ENUM DB sends response to IMS_A
6					→	→					INVITE	IMS_A forwards INVITE to IBCF_A
7					←	←					100 Trying	IBCF_A responds with a 100 Trying provisional response
8							→				INVITE	IBCF_A forwards INVITE to IBCF_B
9							←				100 Trying	IBCF_B responds with a 100 Trying provisional response
10								→			INVITE	IMS_A forwards INVITE to IMS_B
11								←			100 Trying	IMS_B responds with a 100 Trying provisional response
12								←			INVITE	IMS_B forwards INVITE to IBCF_B
13								→			100 Trying	IBCF_B responds with a 100 Trying provisional response
14							←				INVITE	IBCF_B forwards INVITE to IBCF_A
15							→				100 Trying	IBCF_A responds with a 100 Trying provisional response
16					←	←					INVITE	IBCF_A forwards INVITE to IMS_A
17					→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
18				←							INVITE	IMS_A forwards INVITE to UE_B



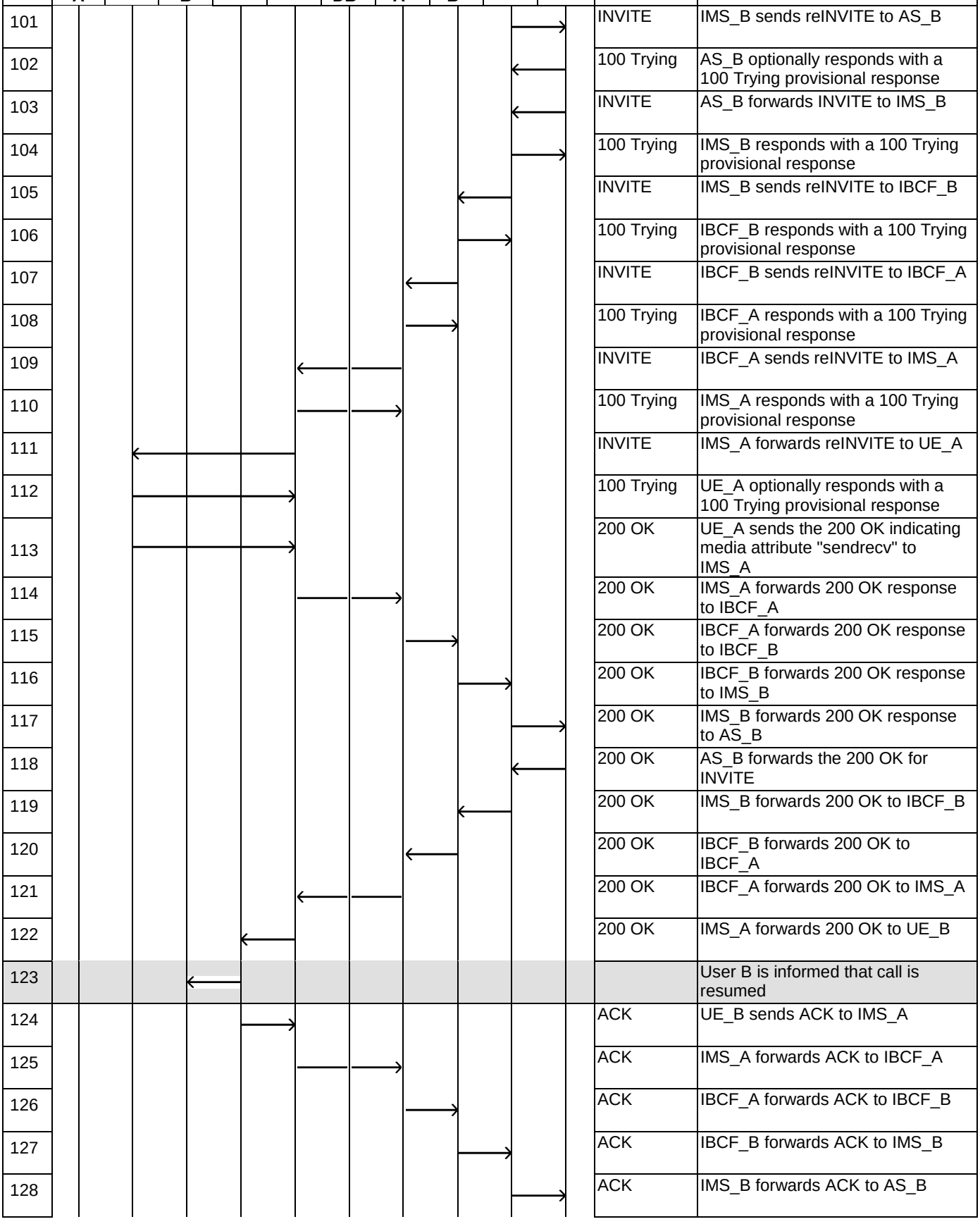
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	ASB		
19				→	→						100 Trying	UE_B optionally responds with a 100 Trying provisional response
20			←	←								User B is informed of incoming call of User A
21				→	→						180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
22					→	→	→				180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
23							→	→			180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24								→	→		180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25								←	←		180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
26							←	←			180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27					←	←	←				180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28		←	←	←	←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
29	←	←										User A is informed that UE_B is ringing
30			→	→								User B answers call
31				→	→						200 OK	UE_B responds to INVITE with 200 OK to indicate that the call has been answered
32					→	→	→				200 OK	IMS_A forwards 200 OK response to IBCF_A
33							→	→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
34								→	→		200 OK	IBCF_B forwards 200 OK response 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 the 200 OK response to UE_A
39	←	←										User A is informed that call has been answered
40					→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
41						→	→				ACK	IMS_A forwards ACK to IBCF_A
42							→	→			ACK	IBCF_A forwards ACK to IBCF_B
43								→	→		ACK	IBCF_B forwards ACK to IMS_B
44								←	←		ACK	IMS_B forwards ACK to IBCF_B
45							←	←			ACK	IBCF_B forwards ACK to IBCF_A



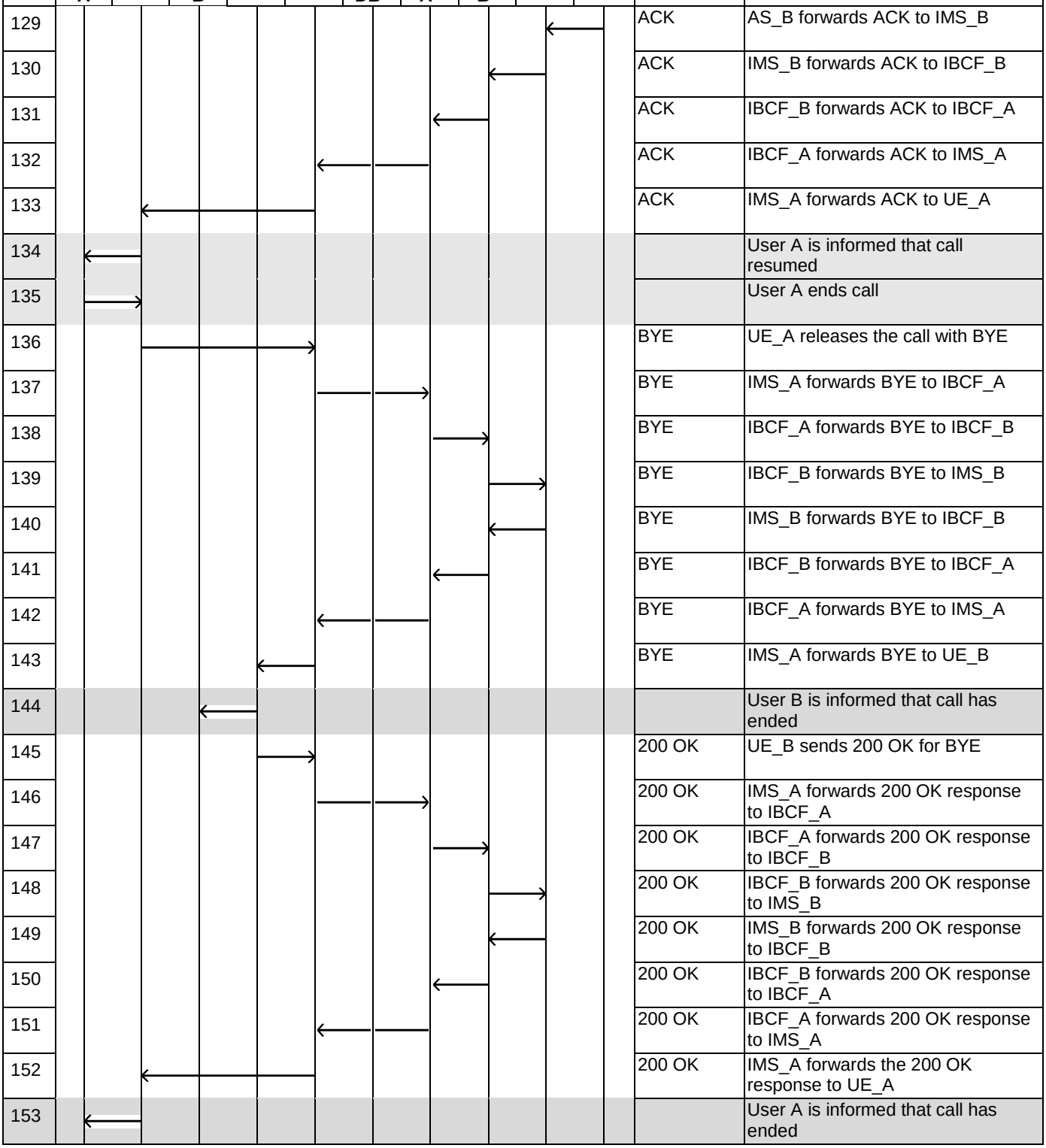
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
46					←						ACK	IBCF_A forwards ACK to IMS_A
47				←							ACK	IMS_A forwards ACK to UE_B
48			←									User B is informed that call is established
49			→									User B puts call on hold
50				→							INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51				←							100 Trying	IMS_A responds with a 100 Trying provisional response
52					→		→				INVITE	IMS_A forwards INVITE to IBCF_A
53					←		←				100 Trying	IBCF_A responds with a 100 Trying provisional response
54								→			INVITE	IBCF_A forwards INVITE to IBCF_B
55								←			100 Trying	IBCF_B responds with a 100 Trying provisional response
56									→		INVITE	IBCF_B forwards INVITE to IMS_B
57									←		100 Trying	IMS_B responds with a 100 Trying provisional response
58										→	INVITE	IMS_B sends reINVITE to AS_B
59										←	100 Trying	AS_B optionally responds with a 100 Trying provisional response
60										←	INVITE	AS_B sends reINVITE to IMS_B
61										→	100 Trying	IMS_B responds with a 100 Trying provisional response
62									←		INVITE	IMS_B forwards reINVITE to IBCF_B
63									→		100 Trying	IBCF_B responds with a 100 Trying provisional response
64								←			INVITE	IBCF_B forwards reINVITE to IBCF_A
65								→			100 Trying	IBCF_A responds with a 100 Trying provisional response
66							←				INVITE	IBCF_A forwards reINVITE to IMS_A
67							→				100 Trying	IMS_A responds with a 100 Trying provisional response
68						←					INVITE	IMS_A forwards reINVITE to UE_A
69						→					100 Trying	UE_A optionally responds with a 100 Trying provisional response
70		←										User A is informed that call is on hold with AS tone
71						→					200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
72							→				200 OK	IMS_A forwards 200 OK response to IBCF_A



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
73											200 OK	IBCF_A forwards 200 OK response to IBCF_B
74											200 OK	IBCF_B forwards 200 OK response to IMS_B
75											200 OK	IMS_B forwards 200 OK response to AS_B
76											200 OK	AS_B forwards 200 OK response to IMS_B
77											200 OK	IMS_B forwards 200 OK response to IBCF_B
78											200 OK	IBCF_B forwards 200 OK response to IBCF_A
79											200 OK	IBCF_A forwards 200 OK response to IMS_A
80											200 OK	IMS_A forward the 200 OK to UE_B
81												User B is informed that the call is on hold
82											ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
83											ACK	IMS_A forwards ACK to IBCF_A
84											ACK	IBCF_A forwards ACK to IBCF_B
85											ACK	IBCF_B forwards ACK to IMS_B
86											ACK	IMS_B forwards ACK to AS_B
87											ACK	AS_B forwards ACK to IMS_B
88											ACK	IMS_B forwards ACK to IBCF_B
89											ACK	IBCF_B forwards ACK to IBCF_A
90											ACK	IBCF_A forwards ACK to IMS_A
91											ACK	IMS_A forwards ACK to UE_A
92												User B resumes call
93											INVITE	UE_B sends second reINVITE message indicating media attribute "sendrecv" (Call Resume)
94											100 Trying	IMS_A responds with a 100 Trying provisional response
95											INVITE	IMS_A sends reINVITE to IBCF_A
96											100 Trying	IBCF_A responds with a 100 Trying provisional response
97											INVITE	IBCF_A sends reINVITE to IBCF_B
98											100 Trying	IBCF_B responds with a 100 Trying provisional response
99											INVITE	IBCF_B sends reINVITE to IMS_B
100											100 Trying	IMS_B responds with a 100 Trying provisional response



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
101									→		INVITE	IMS_B sends reINVITE to AS_B
102									←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
103									←		INVITE	AS_B forwards INVITE to IMS_B
104									→		100 Trying	IMS_B responds with a 100 Trying provisional response
105								←			INVITE	IMS_B sends reINVITE to IBCF_B
106								→			100 Trying	IBCF_B responds with a 100 Trying provisional response
107							←				INVITE	IBCF_B sends reINVITE to IBCF_A
108							→				100 Trying	IBCF_A responds with a 100 Trying provisional response
109					←	←					INVITE	IBCF_A sends reINVITE to IMS_A
110					→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
111		←	←	←							INVITE	IMS_A forwards reINVITE to UE_A
112		→	→	→							100 Trying	UE_A optionally responds with a 100 Trying provisional response
113		→	→	→							200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
114					→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
115							→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
116								→			200 OK	IBCF_B forwards 200 OK response to IMS_B
117									→		200 OK	IMS_B forwards 200 OK response to AS_B
118									←		200 OK	AS_B forwards the 200 OK for INVITE
119								←			200 OK	IMS_B forwards 200 OK to IBCF_B
120							←				200 OK	IBCF_B forwards 200 OK to IBCF_A
121					←	←					200 OK	IBCF_A forwards 200 OK to IMS_A
122				←							200 OK	IMS_A forwards 200 OK to UE_B
123			←									User B is informed that call is resumed
124				→							ACK	UE_B sends ACK to IMS_A
125					→	→					ACK	IMS_A forwards ACK to IBCF_A
126							→				ACK	IBCF_A forwards ACK to IBCF_B
127								→			ACK	IBCF_B forwards ACK to IMS_B
128									→		ACK	IMS_B forwards ACK to AS_B



Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
129									←		ACK	AS_B forwards ACK to IMS_B
130								←			ACK	IMS_B forwards ACK to IBCF_B
131							←				ACK	IBCF_B forwards ACK to IBCF_A
132					←	—					ACK	IBCF_A forwards ACK to IMS_A
133		←	—	—							ACK	IMS_A forwards ACK to UE_A
134	←											User A is informed that call resumed
135	→											User A ends call
136		→	—	—	→						BYE	UE_A releases the call with BYE
137					→	—	→				BYE	IMS_A forwards BYE to IBCF_A
138							→				BYE	IBCF_A forwards BYE to IBCF_B
139								→			BYE	IBCF_B forwards BYE to IMS_B
140								←			BYE	IMS_B forwards BYE to IBCF_B
141							←				BYE	IBCF_B forwards BYE to IBCF_A
142					←	—					BYE	IBCF_A forwards BYE to IMS_A
143				←							BYE	IMS_A forwards BYE to UE_B
144			←									User B is informed that call has ended
145				→							200 OK	UE_B sends 200 OK for BYE
146					→	—	→				200 OK	IMS_A forwards 200 OK response to IBCF_A
147							→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
148								→			200 OK	IBCF_B forwards 200 OK response to IMS_B
149								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
150							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
151					←	—					200 OK	IBCF_A forwards 200 OK response to IMS_A
152		←	—	—							200 OK	IMS_A forwards the 200 OK response to UE_A
153	←											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.

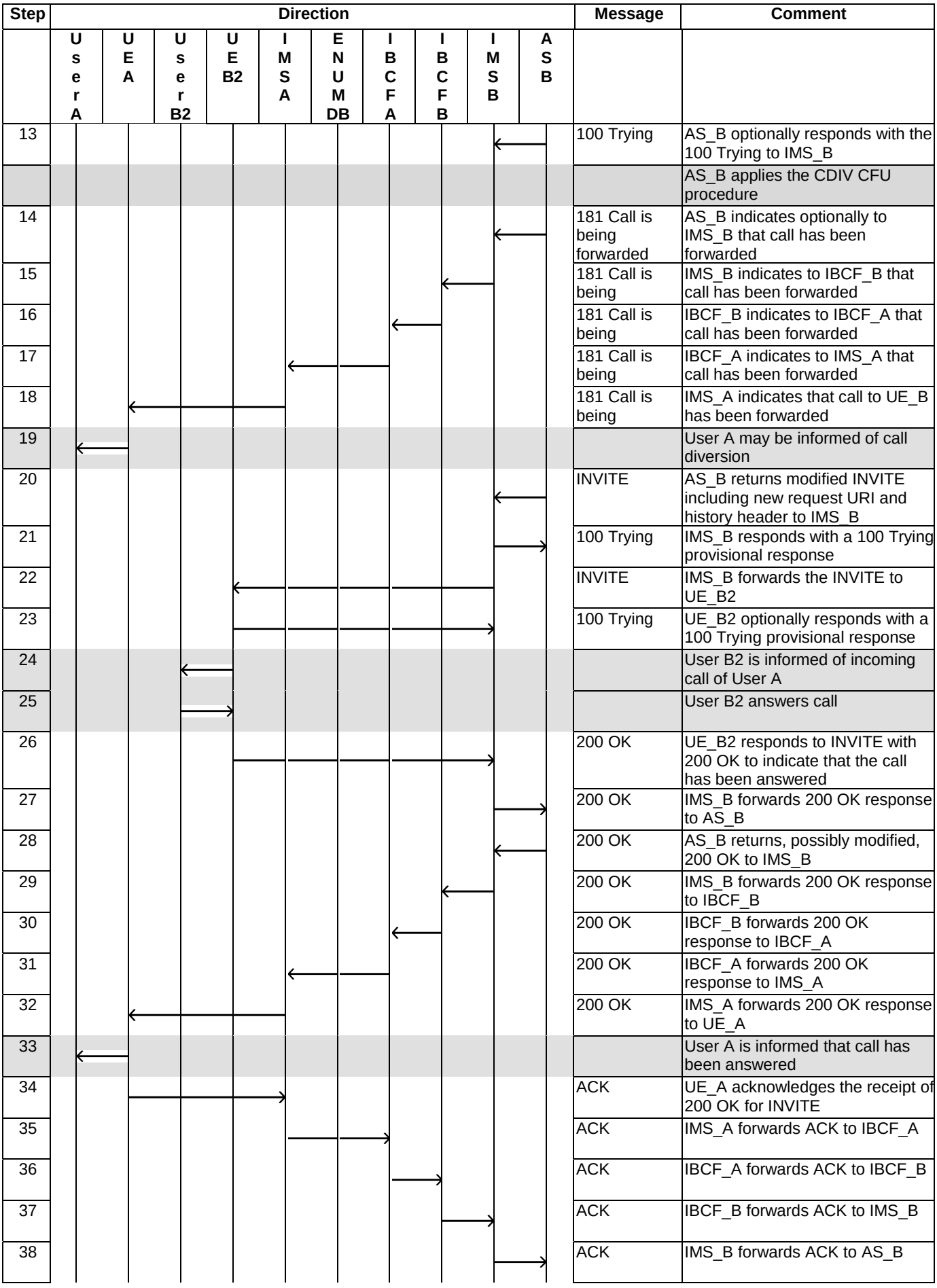
The test sequence typically associated with this use case when is as follows (CFW step numbers refer the call flow step numbering):

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	19	19
3	User B2 is informed of incoming call of User A	24	30
4	User B2 answers call	25	31
5	User A is informed that call has been answered	33	42
6	User B2 is informed that call is established	41	53
7	User A ends call	42	54
8	User B2 is informed that call has ended	48	62
9	User A is informed that call has ended	54	72

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 / ENUM DB / 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		ENUM	IMS_A sends query to ENUM DB
4		ENUM	ENUM DB sends response to IMS_A
5		100 Trying	IMS_A responds with a 100 Trying provisional response
6		INVITE	**IMS_A forwards INVITE to IBCF_A**
7		100 Trying	**IBCF_A responds with a 100 Trying provisional response**
8		INVITE	**IBCF_A forwards INVITE to IBCF_B**
9		100 Trying	**IBCF_B responds with a 100 Trying provisional response**
10		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
11		100 Trying	IMS_B responds with a 100 Trying provisional response
			INVITE triggers the CFU IFC in IMS_B
12		**INVITE**	**IMS_B forwards the INVITE to AS_B**



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

Step	Direction										Message	Comment
	User A	UE A	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
39									←		ACK	AS_B returns, possibly modified, ACK to IMS_B
40				←							ACK	IMS_B forwards ACK to UE_B2
41			←									User B2 is informed that 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 UE_B
48			←								BYE	User B is informed that call has ended
49				→							200 OK	UE_B sends 200 OK for BYE
50								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
51							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
52					←						200 OK	IBCF_A forwards 200 OK response to IMS_A
53		←									200 OK	IMS_A forwards 200 OK response to UE_A
54	←											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	ENUM DB	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					→						ENUM	IMS_A sends query to ENUM DB
4					←						ENUM	ENUM DB sends response to IMS_A

Step	Direction										Message	Comment
	User A	UE A	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
6					→		→				INVITE	IMS_A forwards INVITE to IBCF_A
7					←		←				100 Trying	IBCF_A responds with a 100 Trying provisional response
8							→	→			INVITE	IBCF_A forwards INVITE to IBCF_B
9							←	←			100 Trying	IBCF_B responds with a 100 Trying provisional response
10								→	→		INVITE	IBCF_B forwards INVITE to IMS_B
11								←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the CFU IFC in IMS_B
12									→	→	INVITE	IMS_B forwards the INVITE to AS_B
13									←	←	100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
												AS_B applies the CDIV CFU procedure
14									←	←	181 Call is being forwarded	AS_B indicates optionally to IMS_B that call has been forwarded
15								←	←		181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
16							←	←			181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
17					←		←				181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
18		←		←	←						181 Call is being	IMS_A indicates that call to UE_B has been forwarded
19	←	←										User A may be informed of call diversion
20									←	←	INVITE	AS_B returns modified INVITE including new request URI and history header to IMS_B
21									→	→	100 Trying	IMS_B responds with a 100 Trying provisional response
22								←	←		INVITE	IMS_B forwards the INVITE to IBCF_B
23								→	→		100 Trying	IBCF_B responds with a 100 Trying provisional response
24							←	←			INVITE	IBCF_B forwards the INVITE to IBCF_A
25							→	→			100 Trying	IBCF_A responds with a 100 Trying provisional response
26					←		←				INVITE	IBCF_A forwards the INVITE to IMS_A
27					→		→				100 Trying	IMS_A responds with a 100 Trying provisional response
28				←	←						INVITE	IMS_A forwards the INVITE to UE_B2
29				→	→						100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
30			←	←								User B2 is informed of incoming call of User A

Step	Direction										Message	Comment
	User A	UE A	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
31			→									User B2 answers call
32				→							200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
33					→		→				200 OK	IMS_A forwards 200 OK response to IBCF_A
34								→			200 OK	IBCF_A forwards 200 OK response to IBCF_B
35									→		200 OK	IBCF_B forwards 200 OK response to IMS_B
36										→	200 OK	IMS_B forwards 200 OK response to AS_B
37									←		200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
38								←			200 OK	IMS_B forwards 200 OK response to IBCF_B
39							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
40					←						200 OK	IBCF_A forwards 200 OK response to IMS_A
41		←									200 OK	IMS_A forwards 200 OK response to UE_A
42	←											User A is informed that call has been answered
43		→			→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
44							→				ACK	IMS_A forwards ACK to IBCF_A
45								→			ACK	IBCF_A forwards ACK to IBCF_B
46									→		ACK	IBCF_B forwards ACK to IMS_B
47										→	ACK	IMS_B forwards ACK to AS_B
48									←		ACK	AS_B returns, possibly modified, ACK to IMS_B
49								←			ACK	IMS_B forwards ACK to IBCF_B
50							←				ACK	IBCF_B forwards ACK to IBCF_A
51					←						ACK	IBCF_A forwards ACK to IMS_A
52				←							ACK	IMS_A forwards ACK to UE_B2
53			←									User B2 is informed that call is established
54	→											User A ends call
55		→			→						BYE	UE_A releases the call with BYE
56							→				BYE	IMS_A forwards BYE to IBCF_A
57								→			BYE	IBCF_A forwards BYE to IBCF_B
58									→		BYE	IBCF_B forwards BYE to IMS_B

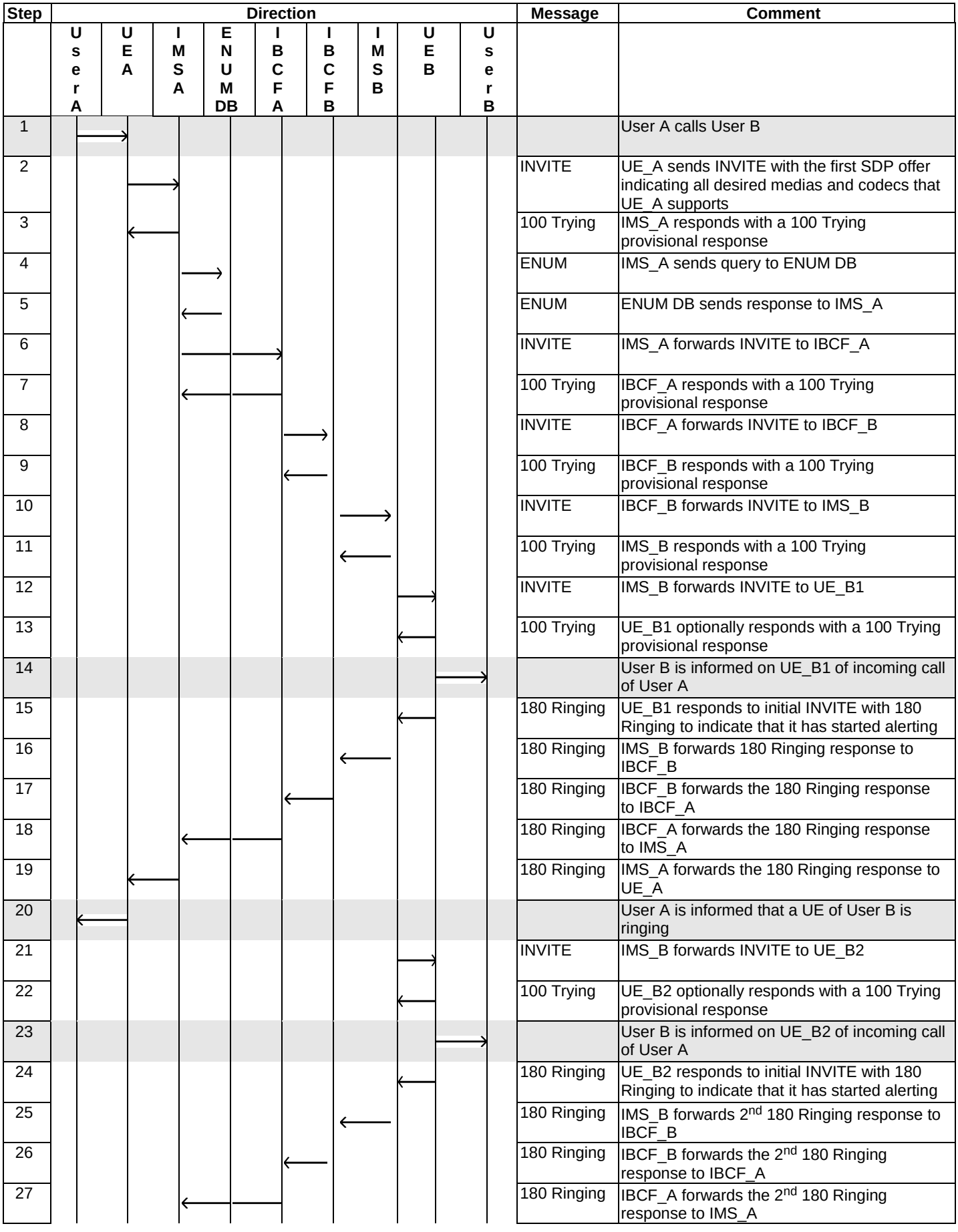
Step	Direction										Message	Comment
	User A	UEA	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	ASB		
59											BYE	IMS_B forwards BYE to IBCF_B
60											BYE	IBCF_B forwards BYE to IBCF_A
61											BYE	IBCF_A forwards BYE to IMS_A
62											BYE	IMS_A forwards BYE to UE_B
63											BYE	User B is informed that call has ended
64											200 OK	UE_B sends 200 OK for BYE
65											200 OK	IMS_A forwards 200 OK response to IBCF_A
66											200 OK	IBCF_A forwards 200 OK response to IBCF_B
67											200 OK	IBCF_B forwards 200 OK response to IMS_B
68											200 OK	IMS_B forwards 200 OK response to IBCF_B
69											200 OK	IBCF_B forwards 200 OK response to IBCF_A
70											200 OK	IBCF_A forwards 200 OK response to IMS_A
71											200 OK	IMS_A forwards 200 OK response to UE_A
72												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

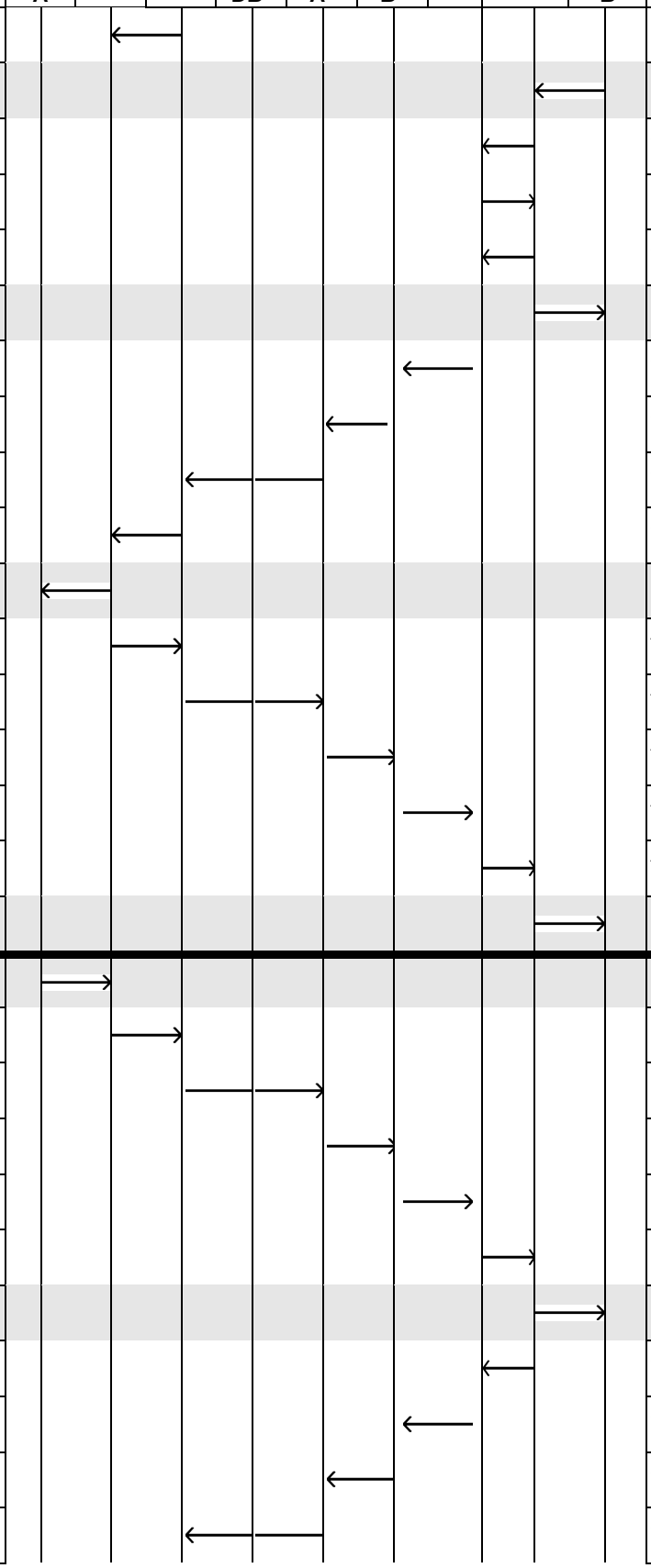
The test sequence and expected call flow sequence when user A calls user B with 2 UEs, i.e. UE_B1 and UEB2, in an interworking scenario is:

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 14
3	User B is informed of incoming call of User A on UE_B2	Step 23
4	User A is informed that a UE of User B is ringing	Step 20
5	User B answers call on UE_B2	Step 29
6	User B is informed at UE_B1 that the call is no longer offered	Step 33
7	User A is informed that call has been answered	Step 38
8	User B is informed that the call is established	Step 44
9A	User A ends call	Step 45A
9B	User B ends call	Step 45B
10A	User B is informed that call has ended	Step 51A
10B	User A is informed that call has ended	Step 51B
11A	User A is informed that call has ended	Step 57A
11B	User B is informed that call has ended	Step 57B

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



Step	Direction	Message	Comment
	User A / UEA / IMSA / ENUMDB / 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		ENUM	IMS_A sends query to ENUM DB
5		ENUM	ENUM DB sends response to IMS_A
6		INVITE	IMS_A forwards INVITE to IBCF_A
7		100 Trying	IBCF_A responds with a 100 Trying provisional response
8		INVITE	IBCF_A forwards INVITE to IBCF_B
9		100 Trying	IBCF_B responds with a 100 Trying provisional response
10		INVITE	IBCF_B forwards INVITE to IMS_B
11		100 Trying	IMS_B responds with a 100 Trying provisional response
12		INVITE	IMS_B forwards INVITE to UE_B1
13		100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
14			User B is informed on UE_B1 of incoming call of User A
15		180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16		180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
17		180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
18		180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
19		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20			User A is informed that a UE of User B is ringing
21		INVITE	IMS_B forwards INVITE to UE_B2
22		100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
23			User B is informed on UE_B2 of incoming call of User A
24		180 Ringing	UE_B2 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
25		180 Ringing	IMS_B forwards 2nd 180 Ringing response to IBCF_B
26		180 Ringing	IBCF_B forwards the 2nd 180 Ringing response to IBCF_A
27		180 Ringing	IBCF_A forwards the 2nd 180 Ringing response to IMS_A



Step	Direction	Message	Comment
	User A / UE A / IMS A / ENUM DB / IBCF A / IBCF B / IMS B / UE B / User B		
28	IMS A → UE A	180 Ringing	IMS_A forwards the 2nd 180 Ringing response to UE_A
29	UE B → User B		User B answers call at UE_B2
30	UE B → UE A	200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
31	UE A → UE B	CANCEL	IMS_B sends CANCEL request to UE_B1
32	UE B → UE A	200 OK	UE_B1 sends 200 OK response to the CANCEL request to IMS_B
33	UE B → User B		UE_B1 informs user B that the call is no longer offered to this UE and stops ringing
34	IMS B → IBCF B	200 OK	IMS_B forwards 200 OK response to IBCF_B
35	IBCF B → IBCF A	200 OK	IBCF_B forwards 200 OK response to IBCF_A
36	IBCF A → IMS A	200 OK	IBCF_A forwards 200 OK response to IMS_A
37	IMS A → UE A	200 OK	IMS_A forwards the 200 OK response to UE_A
38	UE A → User A		User A is informed that call has been answered
39	UE A → IMS A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
40	IMS A → IBCF A	ACK	IMS_A forwards ACK to IBCF_A
41	IBCF A → IBCF B	ACK	IBCF_A forwards ACK to IBCF_B
42	IBCF B → IMS B	ACK	IBCF_B forwards ACK to IMS_B
43	IMS B → UE B	ACK	IMS_B forwards ACK to UE_B
44	UE B → User B		User B is informed that the call is established
45A	User A → UE A		User A ends call
46A	UE A → IMS A	BYE	UE_A releases the call with BYE
47A	IMS A → IBCF A	BYE	IMS_A forwards BYE to IBCF_A
48A	IBCF A → IBCF B	BYE	IBCF_A forwards BYE to IBCF_B
49A	IBCF B → IMS B	BYE	IBCF_B forwards BYE to IMS_B
50A	IMS B → UE B	BYE	IMS_B forwards BYE to UE_B
51A	UE B → User B		User B is informed that call has ended
52A	UE B → UE A	200 OK	UE_B sends 200 OK for BYE
53A	IMS B → IBCF B	200 OK	IMS_B forwards 200 OK response to IBCF_B
54A	IBCF B → IBCF A	200 OK	IBCF_B forwards 200 OK response to IBCF_A
55A	IBCF A → IMS A	200 OK	IBCF_A forwards 200 OK response to IMS_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
56A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
57A	←										User A is informed that call has ended
45B								←			User B ends call
46B										BYE	UE_B releases the call with BYE
47B							←			BYE	IMS_B forwards BYE to IBCF_B
48B						←				BYE	IBCF_B forwards BYE to IBCF_A
49B					←					BYE	IBCF_A forwards BYE to IMS_A
50B			←							BYE	IMS_A forwards BYE to UE_A
51B	←										User A is informed that call has ended
52B		→								200 OK	UE_A sends 200 OK for BYE
53B			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
54B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
55B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
56B								→		200 OK	IMS_B forwards the 200 OK response to UE_B
57B									→		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	14
3	User A is informed that UE_B is ringing	20
4	User B answers call	21
5	User A is informed that call has been answered	27
6	User B is presented that call is established	33
7A	User A adds a new media stream	34A
7B	User B adds a new media stream	34B
8A	User B may be informed to accept/reject new media stream	45A
8B	User A may be informed to accept/reject new media stream	45B
9A	User A may be informed that UE_B is alerting User B	51A
9B	User B may be informed that UE_A is alerting User A	51B
10A	If informed, User B accepts the new media stream	52A
10B	If informed, User A accepts the new media stream	52B

11A	User A is informed that new media stream has been accepted	58A
11B	User B is informed that new media stream has been accepted	58B
12	User A ends call	64
13	User B is informed that call has ended	70
14	User A is informed that call has ended	76

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).

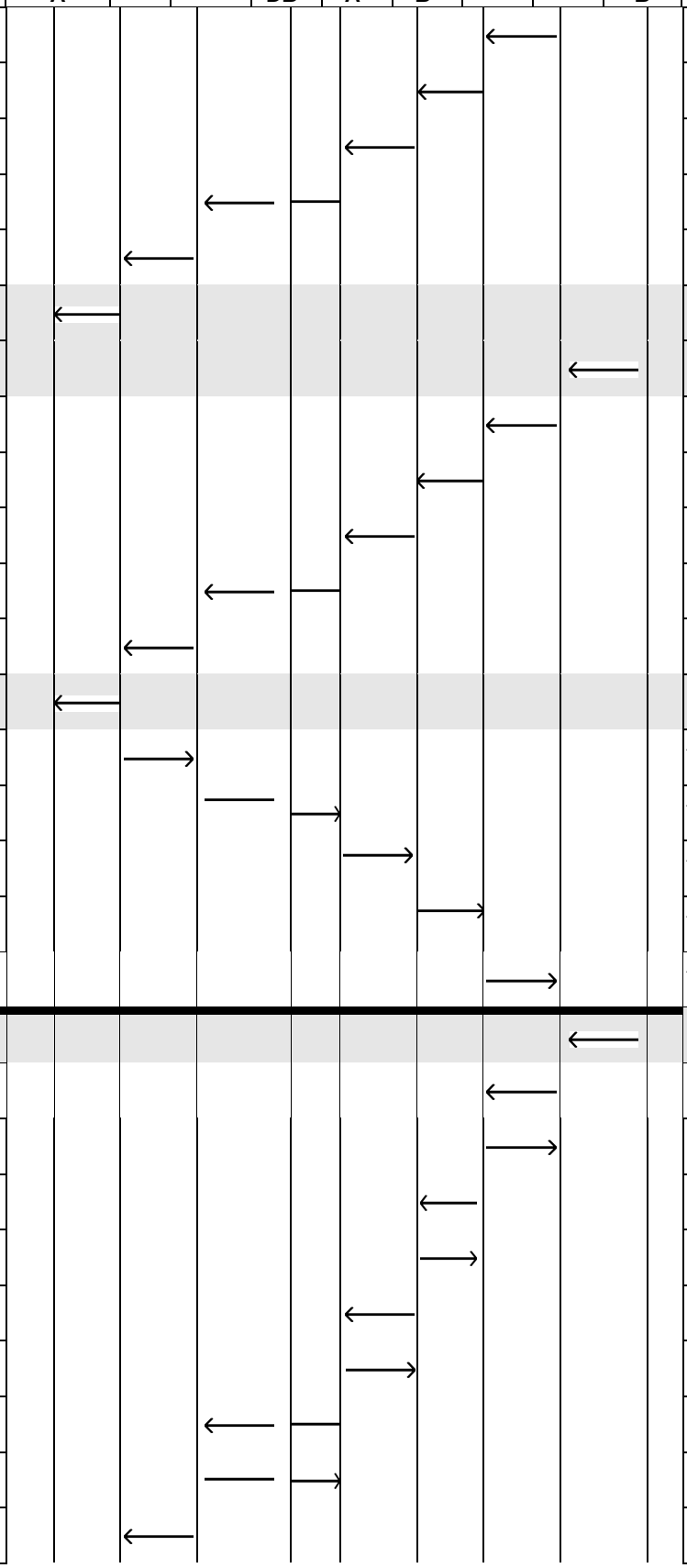
4.4.11.1.1 UC_13: SIP Call Flow "Addition of media stream using reINVITE"

The expected call flow sequence is:

NOTE: After step 63A or 63B in the below message sequence chart the quality assessment test description as described in clause 4.1.2 of DTS/INT-00091 [18] can be applied.

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

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
18			←							180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
19		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20	←										User A is informed that UE_B is ringing
21								←			User B answers call
22							←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
23						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
24					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
25			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
26		←								200 OK	IMS_A forwards 200 OK response to UE_A
27	←										User A is informed that call has been answered
28		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
29			→							ACK	IMS_A forwards ACK to IBCF_A
30					→					ACK	IBCF_A forwards ACK to IBCF_B
31						→				ACK	IBCF_B forwards ACK to IMS_B
32							→			ACK	IMS_B forwards ACK to UE_B
33								→			User B is informed that the call is established
34A	→										User A adds a new media stream
35A		→								INVITE	UE_A sends reINVITE message with new media stream in SDP
36A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
37A			→							INVITE	IMS_A forwards INVITE to IBCF_A
38A			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
39A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
40A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
41A						→				INVITE	IBCF_B forwards INVITE to IMS_B
42A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
43A							→			INVITE	IMS_B forwards INVITE to UE_B
44A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A								→			Verify that User B is informed to accept/reject new media stream (optional)


Step
Direction
User A
UEA
IMSA
ENUMDB
IBCFA
IBCFB
IMSB
UEB
User B
Message
Comment
46A
180 Ringing
UE_B responds to reINVITE with 180 Ringing
47A
180 Ringing
IMS_B forwards 180 Ringing response to IBCF_B
48A
180 Ringing
IBCF_B forwards 180 Ringing response to IBCF_A
49A
180 Ringing
IBCF_A forwards 180 Ringing response to IMS_A
50A
180 Ringing
IMS_A forwards the 180 Ringing response to UE_A
51A
Verify that User A is informed that UE_B is alerting User B (optional)
52A
If informed, User B accepts the new media stream
53A
200 OK
UE_B responds with 200 OK to reINVITE
54A
200 OK
IMS_B forwards 200 OK response to IBCF_B
55A
200 OK
IBCF_B forwards 200 OK response to IBCF_A
56A
200 OK
IBCF_A forwards 200 OK response to IMS_A
57A
200 OK
IMS_A forwards the 200 OK response to UE_A
58A
User A is informed that new media stream has been accepted
59A
ACK
UE_A acknowledges the receipt of 200 OK for INVITE
60A
ACK
IMS_A forwards ACK to IBCF_A
61A
ACK
IBCF_A forwards ACK to IBCF_B
62A
ACK
IBCF_B forwards ACK to IMS_B
63A
ACK
IMS_B forwards ACK to UE_B
34B
User B adds a new media stream
35B
INVITE
UE_B sends reINVITE message with new media stream in SDP
36B
100 Trying
IMS_B responds with a 100 Trying provisional response
37B
INVITE
IMS_B forwards INVITE to IBCF_B
38B
100 Trying
IBCF_B responds with a 100 Trying provisional response
39B
INVITE
IBCF_B forwards INVITE to IBCF_A
40B
100 Trying
IBCF_A responds with a 100 Trying provisional response
41B
INVITE
IBCF_A forwards INVITE to IMS_A
42B
100 Trying
IMS_A responds with a 100 Trying provisional response
43B
INVITE
IMS_A forwards INVITE to UE_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
44B		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
45B	←										Verify that User A is informed to accept/reject new media stream (optional)
46B		→								180 Ringing	UE_A responds to reINVITE with 180 Ringing
47B			→	→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
48B					→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
49B						→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
50B							→	→		180 Ringing	IMS_B forwards the 180 Ringing response to UE_B
51B								→			Verify that User B is informed that UE_A is alerting User A (optional)
52B	→										If informed, User A accepts the new media stream
53B		→								200 OK	UE_A responds with 200 OK to reINVITE
54B			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
55B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
56B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
57B							→	→		200 OK	IMS_B forwards the 200 OK response to UE_B
58B								→			User B is informed that new media stream has been accepted
59B							←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
60B						←				ACK	IMS_B forwards ACK to IBCF_B
61B					←					ACK	IBCF_B forwards ACK to IBCF_A
62B			←	←						ACK	IBCF_A forwards ACK to IMS_A
63B		←								ACK	IMS_A forwards ACK to UE_A
64	→									BYE	User A releases the call
65		→								BYE	UE_A sends BYE to indicate that the call has ended
66			→	→						BYE	IMS_A forwards the BYE to IBCF_A
67					→					BYE	IBCF_A forwards the BYE to IBCF_B
68						→				BYE	IBCF_B forwards the BYE to IMS_B
69							→	→		BYE	IMS_B forwards the BYE to UE_B
70								→			User B is informed that call has ended
71							←			200 OK	UE_B responds to the BYE with 200 OK

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
72						←				200 OK	IMS_B forwards the 200 OK response to IBCF_B
73					←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
74				←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
75			←							200 OK	IMS_A forwards the 200 OK response to UE_A
76		←									User A is informed that call has ended

4.4.12 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	64A	64A
2B	User B removes one of the media streams	64B	64B
3A	User B is informed that the media stream has been removed	70A	75A
3B	User A is informed that the media stream has been removed	70B	75B
4	User A releases the call	76	86
5	User B is informed that call has ended	82	92
6	User A is informed that call has ended	88	98

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	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
1	→										User A initiates a multimedia session with at least two streams with User B
64A	→										User A removes one of the media streams
65A		→								UPDATE	UE_A sends UPDATE to IMS_A
66A			→	→						UPDATE	IMS_A forwards the UPDATE to IBCF_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
67A						→				UPDATE	IBCF_A forwards the UPDATE to IBCF_B
68A							→			UPDATE	IBCF_B forwards the UPDATE to IMS_B
69A								→		UPDATE	IMS_B forwards the UPDATE to UE_B
70A									→		User B is informed that the media stream has been removed
71A								←		200 OK	UE_B responds with 200 OK to UPDATE
72A							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
73A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
74A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
75A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
64B								←			User B removes one of the media streams
65B							←			UPDATE	UE_B sends UPDATE to IMS_B
66B						←				UPDATE	IMS_B forwards the UPDATE to IBCF_B
67B					←					UPDATE	IBCF_B forwards the UPDATE to IBCF_A
68B				←						UPDATE	IBCF_A forwards the UPDATE to IMS_A
69B		←								UPDATE	IMS_A forwards the UPDATE to UE_A
70B	←										User A is informed that the media stream has been removed
71B		→								200 OK	UE_A responds with 200 OK to UPDATE
72B			→	→						200 OK	IMS_A forwards the 200 OK response to IBCF_A
73B					→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
74B						→				200 OK	IBCF_B forwards the 200 OK response to IMS_B
75B							→			200 OK	IMS_B forwards the 200 OK response to UE_B
76	→										User A releases the call
77		→								BYE	UE_A sends BYE to IMS_A
78			→	→						BYE	IMS_A sends BYE to IBCF_A
79					→					BYE	IBCF_A sends BYE to IBCF_B
80						→				BYE	IBCF_B forwards the BYE to IMS_B
81							→			BYE	IMS_B forwards the BYE to UE_B
82								→			User B is informed that call has ended

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
83							←			200 OK	UE_B sends 200 OK response for BYE
84						←				200 OK	IMS_B forwards the 200 OK response to IBCF_B
85					←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
86			←							200 OK	IBCF_A forwards the 200 OK response to IMS_A
87		←								200 OK	IMS_A forwards the 200 OK response to UE_A
88	←										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	ENUM DB	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
64A	→										User A removes one of the media streams
65A		→								INVITE	UE_A sends reINVITE to IMS_A
66A										100 Trying	IMS_A responds with a 100 Trying provisional response
67A			→		→					INVITE	IMS_A forwards the reINVITE to IBCF_A
68A			←		←					100 Trying	IBCF_A responds with a 100 Trying provisional response
69A						→				INVITE	IBCF_A forwards the reINVITE to IBCF_B
70A						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
71A							→			INVITE	IBCF_B forwards the reINVITE to IMS_B
72A							←			100 Trying	IMS_B responds with a 100 Trying provisional response
73A								→		INVITE	IMS_B forwards the reINVITE to UE_B
74A								←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
75A									→		User B is informed that the media stream has been removed
76A								←		200 OK	UE_B responds with 200 OK to reINVITE
77A							←			200 OK	IMS_B forwards the 200 OK response to IBCF_B
78A						←				200 OK	IBCF_B forwards the 200 OK response to IBCF_A
79A					←					200 OK	IBCF_A forwards the 200 OK response to IMS_A
80A			←							200 OK	IMS_A forwards the 200 OK response to UE_A
81A			→							ACK	UE_A acknowledges the receipt of 200 OK for reINVITE
82A					→					ACK	IMS_A forwards the ACK to IBCF_A
83A						→				ACK	IBCF_A forwards the ACK to IBCF_B
84A							→			ACK	IBCF_B forwards the ACK to IMS_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
85A							→			ACK	IMS_B forwards the ACK to UE_B
64B								←			User B removes one of the media streams
65B							←			INVITE	UE_B sends reINVITE to IMS_B
66B							→			100 Trying	IMS_B responds with a 100 Trying provisional response
67B						←				INVITE	IMS_B forwards the reINVITE to IBCF_B
68B						→				100 Trying	IBCF_B responds with a 100 Trying provisional response
69B					←					INVITE	IBCF_B forwards the reINVITE to IBCF_A
70B					→					100 Trying	IBCF_A responds with a 100 Trying provisional response
71B			←							INVITE	IBCF_A forwards the reINVITE to IMS_A
72B			→							100 Trying	IMS_A responds with a 100 Trying provisional response
73B		←								INVITE	IMS_A forwards the reINVITE to UE_A
74B		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
75B	←										User A is informed that the media stream has been removed
76B		→								200 OK	UE_A responds with 200 OK to reINVITE
77B			→							200 OK	IMS_A forwards the 200 OK response to IBCF_A
78B					→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
79B						→				200 OK	IBCF_B forwards the 200 OK response to IMS_B
80B							→			200 OK	IMS_B forwards the 200 OK response to UE_B
81B							←			ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
82B						←				ACK	IMS_B forwards ACK to IBCF_B
83B					←					ACK	IBCF_B forwards ACK to IBCF_A
84B			←							ACK	IIBCF_A forwards ACK to IMS_A
85B		←								ACK	IMS_A forwards ACK to UE_A
86	→										User A releases the call
87		→								BYE	UE_A sends BYE to IMS_A
88			→							BYE	IMS_A forwards BYE to IBCF_A
89					→					BYE	IBCF_A forwards BYE to IBCF_B
90						→				BYE	IBCF_B forwards BYE to IMS_B
91							→			BYE	IMS_B forwards BYE to UE_B
92								→			User B is informed that call has ended
93							←			200 OK	UE_B sends 200 OK for BYE
94						←				200 OK	IMS_B forwards the 200 OK response to IBCF_B
95					←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
96			←							200 OK	IBCF_A forwards the 200 OK response to IMS_A
97		←								200 OK	IMS_A forwards the 200 OK response to UE_A
98	←										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 33
6	User A is notified that User B is being invited to join the call	Step 41
7	User B joins the conference	Step 48
8	User A is notified that User B has joined the conference	Step 57
9	User B leaves the conference	Step 60
10	User B is informed that the conference has ended	Step 71
11	User A is notified that user B has left the conference	Step 74

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:

NOTE: After step 59 in the below message sequence chart the quality assessment test description as described in clause 4.1.3 of DTS/INT-00091 [18] can be applied.

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	ASA	IBCF A	IBCF B	IMS B	ASB		
1	→												User A initiates an ad-hoc conference call
2		→	→		→							INVITE	UE_A sends INVITE to IMS_A with information for all commonly supported presence elements
3		←										100 Trying	IMS_A responds with a 100 Trying provisional response

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	AS A	IBCF A	IBCF B	IMS B	AS B		
4	←												User A is informed the Ad Hoc Conference Call is being set up
5					→	→						INVITE	IMS_A forwards INVITE to IMS_A AS
6					→	→						100 Trying	IMS_A AS responds with a 100 Trying provisional response
7					→	→						200 OK	IMS_A AS responds with a 200 OK to IMS_A, with isfocus parameter
8		←			←							200 OK	IMS_A forwards the 200OK response to UE_A
9	←												User A is informed the Ad Hoc Conference Call is established
10		→			→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→	→						ACK	IMS_A forwards the ACK to IMS_A AS
12	→												User A invites user B to join the ad-hoc conference call
13		→			→							REFER	UE_A sends REFER message to IMS_A, with Refer-To : <UE_B uri ;method=INVITE>
14					→	→						REFER	IMS_A forwards the REFER to IMS_A AS
15					←							202 Accepted	IMS_A AS responds with a 202 Accepted
16		←			←							202 Accepted	IMS_A forwards the 202 Accepted response to UE_A
17					←							NOTIFY	IMS_A AS sends a NOTIFY to IMS_A to inform the conference initiator the REFER message is being processed
18		←			←							NOTIFY	IMS_A forwards the NOTIFY to UE_A
19		→			→							200 OK	UE_A responds with 200 OK to IMS_A
20					→	→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
21					←							INVITE	IMS_A AS sends INVITE to UE_B with conference-factory URI (received in the REFER message from UE A)
22					→	→						100 Trying	IMS_A responds with a 100 Trying provisional response
23					→							ENUM	IMS_A sends query to ENUM DB
24					←							ENUM	ENUM DB sends response to IMS_A
25					→	→	→					INVITE	IMS_A forwards the INVITE to IBCF_A
26					←							100 Trying	IBCF_A responds with a 100 Trying provisional response
27									→			INVITE	IBCF_A forwards the INVITE to IBCF_B
28									←			100 Trying	IBCF_B responds with a 100 Trying provisional response
29										→		INVITE	IBCF_B forwards the INVITE to IMS_B

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

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	ASA	IBCFA	IBCFB	IMSB	ASB		
56		←	—	—								NOTIFY	IMS_A forwards NOTIFY to UE_A
57	←												User A is alerted that User B has joined the conference
58		—	—	→								200 OK	UE_A sends 200 OK response for NOTIFY
59					—	→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
60			→										User B leaves the conference
61				—	—	—	—	—	—	→		BYE	UE_B sends BYE to IMS_B to leave the conference
62									←			BYE	IMS_B forwards the BYE to IBCF_B
63								←				BYE	IBCF_B forwards the BYE to IBCF_A
64					←		—					BYE	IBCF_A forwards the BYE to IMS_A
65						→						BYE	IMS_A forwards the BYE to IMS_A AS
66					←							200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK response for BYE
67							→					200 OK	IMS_A forwards the 200 OK response to IBCF_A
68								→				200 OK	IBCF_A forwards the 200 OK response to IBCF_B
69									→			200 OK	IBCF_B forwards the 200 OK response to IMS_B
70				←								200 OK	IMS_B forwards the 200 OK response to UE_B
71			←										User B is informed that the conference has ended
72					←							NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the conference
73		←										NOTIFY	IMS_A forwards NOTIFY to UE_A
74	←												User A is notified that user B has left the conference
75		—	—	→								200 OK	UE_A sends a 200 OK response for NOTIFY
76					—	→						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 [16].

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 [13]. 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:

NOTE: After step 7 in the below message sequence chart the quality assessment test description as described in clause 4.1.4 of DTS/INT-00091 [18] can be applied.

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 BC session
2	UE A → UE B → IMS A	INVITE	UE_A sends INVITE to IMS_A
3	IMS A → AS A	INVITE	IMS_A forwards the INVITE to AS_A
4	AS A → IMS A	200 OK	AS_A responds with 200 OK
5	UE A ← UE B ← IMS A	200 OK	IMS_A forwards the 200 OK response to UE_A
6	UE A → UE B → IMS A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE
7	IMS A → AS A	ACK	IMS_A forwards the ACK to AS_A
8	User A ← UE A ← UE B ← IMS A		User A receives the broadcast content
9	User A → UE A		User A terminates the session
10	UE A → UE B → IMS A	BYE	UE_A sends BYE to IMS_A
11	IMS A → AS A	BYE	IMS_A forwards the BYE to AS_A
12	AS A → IMS A	200 OK	AS_A responds with 200 OK
13	UE A ← UE B ← IMS A	200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
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. TS 183 063 [13] 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 [13]. The call flow path and node configuration for this use case corresponds to CF_IPTV.

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

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

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

The expected call flow sequence is:

Step	Direction								Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IMS B	AS B		
1	→									User A initiates a CoD session (content selection)
2		→	→	→					INVITE	UE_A sends a INVITE to IMS_A
3					→				INVITE	IMS_A forwards the INVITE to AS_A (SCF)
4					←				INVITE	AS_A forwards the INVITE to IMS_A
5					→				INVITE	IMS_A forwards the INVITE to AS_A (MF)
6					←				200 OK	AS_A (MF) responds with 200 OK
7					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
8					←				200 OK	AS_A forwards the 200 OK response to IMS_A
9		←	←	←					200 OK	IMS_A forwards the 200 OK response to UE_A
10		→	→	→					ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→				ACK	IMS_A forwards the ACK to AS_A (SCF)
12					←				ACK	AS_A forwards the ACK to IMS_A
13					→				ACK	IMS_A forwards the ACK to AS_A (MF)
										UE_A sets up RTSP with AS_A (MF)
14		→	→	→					INVITE	UE_A sends reINVITE message indicating media attribute " a=recvonly "
15					→				INVITE	IMS_A forwards the reINVITE to AS_A (SCF)
16					←				INVITE	AS_A forwards the reINVITE to IMS_A
17					→				INVITE	IMS_A forwards the reINVITE to AS_A (MF)
18					←				200 OK	AS_A (MF) responds with 200 OK
19					→				200 OK	IMS_A forwards the 200 OK response to AS_A (SCF)
20					←				200 OK	IMS_B forwards the 200 OK response to IMS_A
21		←	←	←					200 OK	IMS_A forwards the 200 OK response to UE_A

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
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 [13]. 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.

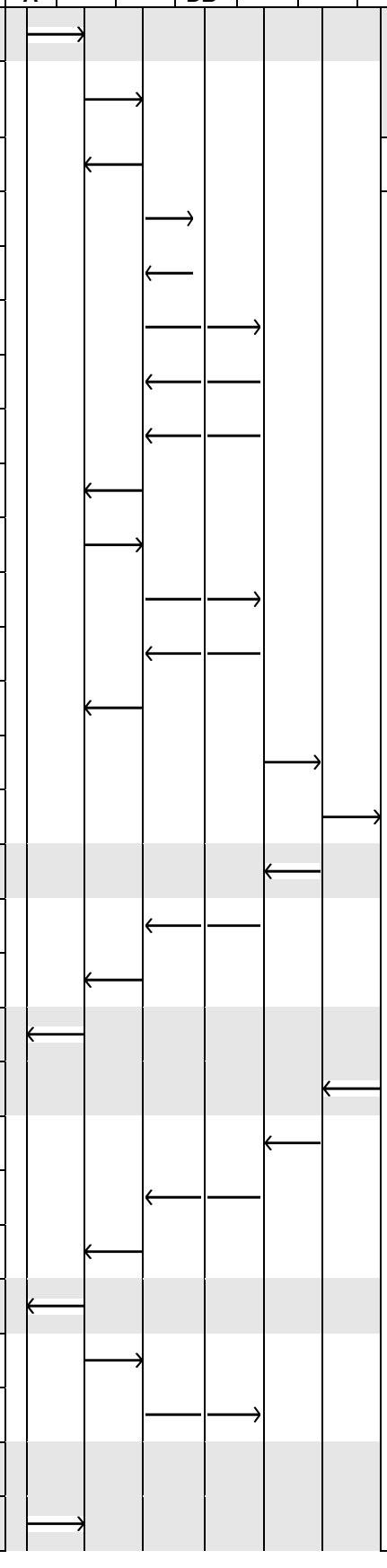
4.4.16.1.2 UC_23: IMS-to-PSTN call

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 15
3	User A is informed that UE_B is ringing	Step 19
4	User B answers call	Step 20
5	User A is informed that call has been answered	Step 24
6	User A and B can communicate	Step 27
7	User A ends call	Step 28A
8	User B is informed that call has ended	Step 32A
9	User A is informed that call has ended	Step 36A
10	User B ends call	Step 28B
11	User B is informed that call has ended	Step 31B
12	User A is informed that call has ended	Step 34B

The expected call flow sequence is:

NOTE: After step 27 in the below message sequence chart the quality assessment test description as described in clause 4.1.5 of TS 103 189 [18] can be applied.



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

Step	Direction							Message	Comment
	User A	UE A	IMS A	ENUM DB	MGCF	PSTN	User B		
29A		→						BYE	UE_A sends BYE
30A			→		→			BYE	IMS_A forwards BYE to MGCF
31A						→		REL	MGCF sends REL to PSTN
32A							→		User B is informed that call has ended
33A					←			RLC	PSTN sends RLC response to MGCF
34A			←					200 OK	MGCF sends 200 OK response to IMS_A
35A		←						200 OK	IMS_A forwards the 200 OK response to UE_A
36A	←								User A is informed that call has ended
28B							←		User B ends call
29B					←			REL	PSTN sends BYE to MGCF
30B						→		RLC	MGCF responds RLC to PSTN
31B							→		User B is informed that call has ended
32B			←					BYE	MGCF sends BYE to IMS_A
33B		←						BYE	IMS_A forwards BYE to UE_A
34B	←								User A is informed that call has ended
35B		→						200 OK	UE_A sends 200 OK for BYE
36B			→		→			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_24: 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:

NOTE: After step 28 in the below message sequence chart the quality assessment test description as described in clause 4.1.6 of TS 103 189 [18] can be applied.

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

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
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
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

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
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 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 [15] 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 6 (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	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
1		→									User A sends an instant message to user B
2			→							MESSAGE	UE_A sends MESSAGE to IMS_A
3				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response 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

4.5.1.2 ENUM Query - Functionality test

Interoperability Test Description		
Identifier:	TD_IMS_ENUM_0001	
Summary:	ENUM query should result in return of NAPTR with correct SIP URI	
Configuration:	CF_INT_CALL	
SUT:	ENUM _A and ENUM_DB	
References:	**Test Purpose**	**Specification Reference**
	TP_IMS_ENUM_01	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 10 in 1st numbered list)
Use Case ref.:	UC_2_I	
Pre-test conditions:	• ENUM DB is configured with data for UE_B • IMS_A (and B) are configured to support ENUM • HSS of IMS_A and of IMS B is configured according to table 1 • UE_A has IP bearer established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A calls User B telURI
	2	Verify that user B is informed of incoming call of User A

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_ENUM_01 in CFW step 5 (NAPTR Response): *ensure that {* *when { UE_A sends an initial INVITE for UE_B to IMS_A* *containing a Request_URI* *indicating a Tel_URI* *and IMS_A sends a NAPTR_Query to ENUM_DB* *containing the TN derived_from the Tel_URI_E.164_Number* *}* *then { ENUM_DB sends a NAPTR_Response to IMS_A* *containing a NAPTR_Resource_Record* *containing the TTL of the NAPTR_record* *containing the service_type* *indicating E2U+sip* *containing the_regular_expression* *indicating !^(.*)$!* *containing the SIP_URI of UE_B* *indicating backreference (\1) for the user part* *indicating domain name for the host part* *containing SIP_URI_parameters 'if applicable' }* *}}*

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
5				←						ENUM	ENUM DB sends response to IMS_A
6					→					INVITE	IMS_A forwards INVITE to IBCF_A
7					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→				INVITE	IBCF_A forwards INVITE to IBCF_B
9						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
10							→			INVITE	IBCF_B forwards INVITE to IMS_B
11							←			100 Trying	IMS_B responds with a 100 Trying provisional response
12								→		INVITE	IMS_B forwards INVITE to UE_B
13								←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
14									→		User B is informed of incoming call of User A

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 { IUT receives a REGISTER from UE_B }* *then { IUT sends the REGISTER to IMS_B* *containing a Path_header* *including P-CSCF_SIP_URI of IUT_ and* *including IMS_flow_token and* *including SIP_URI parameter "ob" and* *containing a Require_header* *including a path_option_tag and* *containing a P-Charging-Vector_header* *including an icid-value_parameter and* *including an orig-ioi_parameter indicating IMS_A and* *not including a term-ioi_parameter and* *containing an Authorization_header* *including an integrity-protected_parameter set to no and* *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 { IUT receives a REGISTER from UE_B }* *then { IUT sends the REGISTER to IMS_B* *containing a Path_header* *including P-CSCF_SIP_URI of IUT_ and* *including IMS_flow_token and* *including SIP_URI parameter "ob" and* *containing a Require_header* *including a path_option_tag and* *containing a P-Charging-Vector_header* *including an icid-value_parameter and* *including an orig-ioi_parameter indicating IMS_A and* *not including a term-ioi_parameter and* *containing an Authorization_header* *including an integrity-protected_parameter set to yes and* *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 { IUT receives a REGISTER from UE_B }* *then { IUT sends the REGISTER to IMS_B* *containing a Path_header* *including P-CSCF_SIP_URI of IUT_ and* *including IMS_flow_token and* *including SIP_URI parameter "ob" and* *containing a Require_header* *including a path_option_tag and* *containing a P-Charging-Vector_header* *including an icid-value_parameter and* *including an orig-ioi_parameter indicating IMS_A and* *not including a term-ioi_parameter and* *containing an Authorization_header* *including an integrity-protected_parameter set ip-assoc-pending* *or* *not including an integrity-protected_parameter and* *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' }* *}*
	2	TP_IMS_5011_04 in CFW step 12 (REGISTER): *ensure that {* *when { IUT receives a REGISTER from UE_B* *containing an Authorization_header }* *then { IUT sends the REGISTER to IMS_B* *containing a Path_header* *including P-CSCF_SIP_URI of IUT_ and* *including IMS_flow_token and* *including SIP_URI parameter "ob" and* *containing a Require_header* *including a path_option_tag and* *containing a P-Charging-Vector_header* *including an icid-value_parameter and* *including an orig-ioi_parameter indicating IMS_A and* *not including a term-ioi_parameter and* *containing an Authorization_header* *including an integrity-protected_parameter set to ip-assoc-yes and* *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		
	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_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 auth }* *}*
	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 }* *}*

Interoperability Test Description		
	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
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

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

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

Interoperability Test Description		
		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
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	

Interoperability Test Description		
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* *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

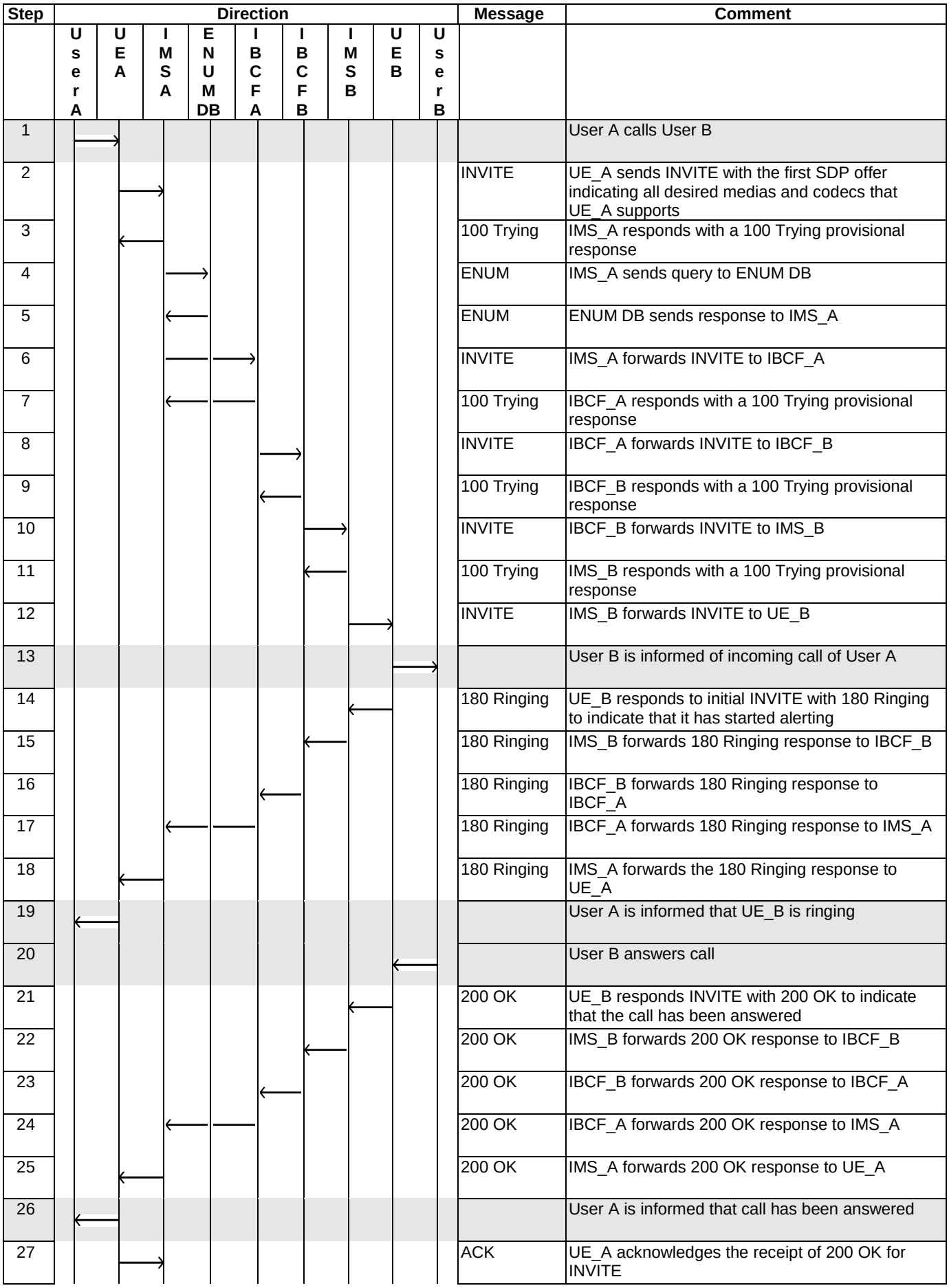
4.5.3.1.1 Initial INVITE Request Procedures - Originating

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 6th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 6th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 3 in 3rd numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 3rd numbered list)
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 11)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 11)
Use Case ref.:	UC_02_I	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B 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 8 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid-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 8 (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 8 (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 NAPTR_Query to ENUM_DBDB* *containing the Tel_URI_E.164_Number }* *when { IMS_A receives NAPTR_Response from ENUM_DB* *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 29 (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 36A (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 16 (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 23 (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 16 (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 23 (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 / ENUM DB / 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		ENUM	IMS_A sends query to ENUM DB
5		ENUM	ENUM DB sends response to IMS_A
6		INVITE	IMS_A forwards INVITE to IBCF_A
7		100 Trying	IBCF_A responds with a 100 Trying provisional response
8		INVITE	IBCF_A forwards INVITE to IBCF_B
9		100 Trying	IBCF_B responds with a 100 Trying provisional response
10		INVITE	IBCF_B forwards INVITE to IMS_B
11		100 Trying	IMS_B responds with a 100 Trying provisional response
12		INVITE	IMS_B forwards INVITE to UE_B
13			User B is informed of incoming call of User A
14		180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
15		180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
16		180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
17		180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
18		180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
19			User A is informed that UE_B is ringing
20			User B answers call
21		200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
22		200 OK	IMS_B forwards 200 OK response to IBCF_B
23		200 OK	IBCF_B forwards 200 OK response to IBCF_A
24		200 OK	IBCF_A forwards 200 OK response to IMS_A
25		200 OK	IMS_A forwards 200 OK response to UE_A
26			User A is informed that call has been answered
27		ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
28			→	→						ACK	IMS_A forwards ACK to IBCF_A
29					→					ACK	IBCF_A forwards ACK to IBCF_B
30						→				ACK	IBCF_B forwards ACK to IMS_B
31							→			ACK	IMS_B forwards ACK to UE_B
32								→			User B is informed that the call is established
33A	→										User A ends call
34A		→								BYE	UE_A releases the call with BYE
35A			→	→						BYE	IMS_A forwards BYE to IBCF_A
36A					→					BYE	IBCF_A forwards BYE to IBCF_B
37A						→				BYE	IBCF_B forwards BYE to IMS_B
38A							→			BYE	IMS_B forwards BYE to UE_B
39A								→			User B is informed that call has ended
40A							←			200 OK	UE_B sends 200 OK for BYE
41A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
42A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
43A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
44A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
45A	←										User A is informed that call has ended

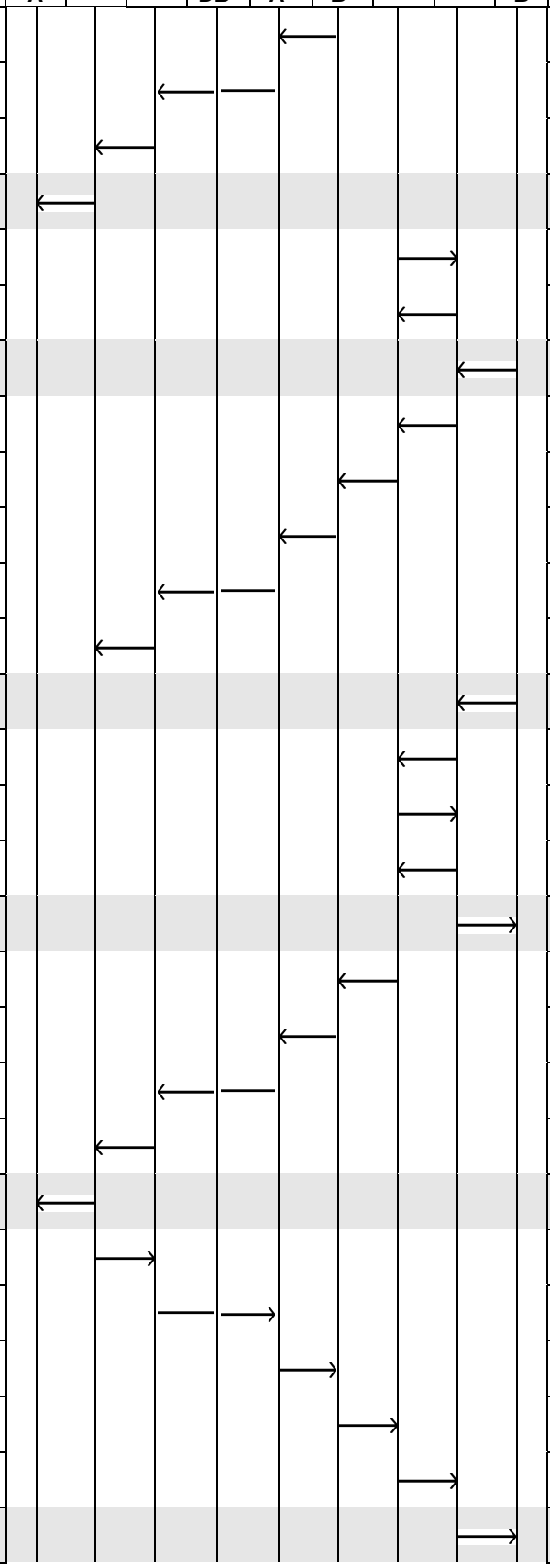
4.5.3.1.1.2 Default SIP URI

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 6th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 6th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)

Interoperability Test Description		
	TP_IMS_5131_01	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 11)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 11)
Use Case ref.:	UC_12	
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 8 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid-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 41 (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 48A (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 17 and 26 (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 35 (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 17and17 and 26 (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 35 (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**	**ENUM DB**	**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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6				→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7				←	←					100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→				INVITE	IBCF_A forwards INVITE to IBCF_B
9						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
10							→			INVITE	IBCF_B forwards INVITE to IMS_B
11							←			100 Trying	IMS_B responds with a 100 Trying provisional response
12								→		INVITE	IMS_B forwards INVITE to UE_B1
13								←		100 Trying	UE_B1 optionally responds with a 100 Trying provisional response
14									→		User B is informed on UE_B1 of incoming call of User A
15								←		180 Ringing	UE_B1 responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16						←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IBCF_B**



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

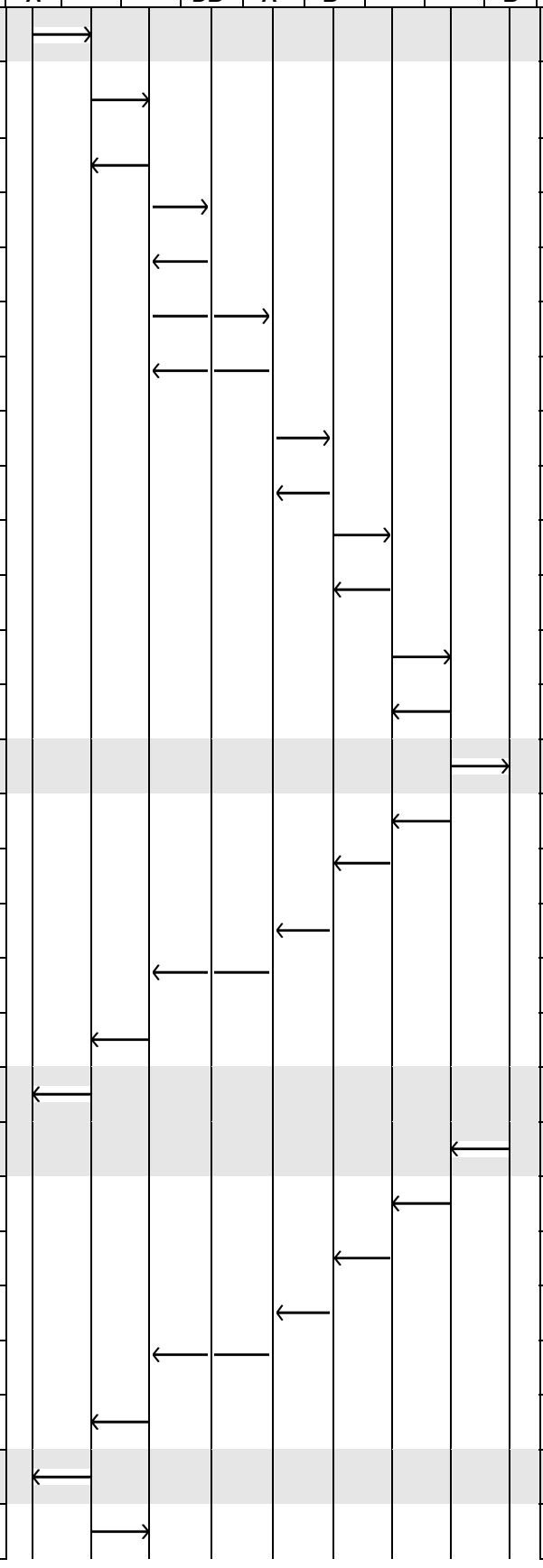
Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
45A	→										User A ends call
46A		→								BYE	UE_A releases the call with BYE
47A			→	→						**BYE**	**IMS_A forwards BYE to IBCF_A**
48A					→					BYE	IBCF_A forwards BYE to IBCF_B
49A						→				BYE	IBCF_B forwards BYE to IMS_B
50A							→			BYE	IMS_B forwards BYE to UE_B
51A								→			User B is informed that call has ended
52A							←			200 OK	UE_B sends 200 OK for BYE
53A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
57A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
58A			←	←						200 OK	IBCF_A forwards 200 OK response to IMS_A
59A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
60A	←										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 6th numbered list)
	TP_IMS_5107_01	TS 124 229 [1], clause 5.4.3.2 ¶119 (item 1 in 6th numbered list)
	TP_IMS_5115_01	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)
	TP_IMS_5115_03	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 3rd numbered list)
	TP_IMS_5115_02	TS 124 229 [1], clause 5.4.3.3 ¶91 (item 2 in 3rd numbered list)
	TP_IMS_5115_04	TS 124 229 [1], clause 5.4.3.3 ¶92 (item 2 in 3rd numbered list)
	TP_IMS_5131_01	TS 124 229 [1], clause 5.4.3.3 ¶62 (after note 11)
	TP_IMS_5131_02	TS 124 229 [1], clause 5.3.2.1 ¶62 (after note 11)
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 8 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid-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 8 (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 30 (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 37A (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 17 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_A receives the 180_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B*
	6	TP_IMS_5115_03 in CFW step 17 (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 24 (2xx): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *containing a P-Charging-Vector_header* *containing an orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B* *}*
	8	TP_IMS_5115_04 in CFW step 24 (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 17 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *not containing a P-Charging-Function-Addresses_header }* *}*
	10	TP_IMS_5131_02 in CFW step 24 (2xx) *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response from IMS_B* *not containing a P-Charging-Function-Addresses_header }* *}*



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

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
29			→	→						ACK	IMS_A forwards ACK to IBCF_A
30					→					ACK	IBCF_A forwards ACK to IBCF_B
31						→				ACK	IBCF_B forwards ACK to IMS_B
32							→			ACK	IMS_B forwards ACK to UE_B
33								→			User B is informed that the call is established
34A		→									User A ends call
35A			→							BYE	UE_A releases the call with BYE
36A			→	→						BYE	IMS_A forwards BYE to IBCF_A
37A					→					BYE	IBCF_A forwards BYE to IBCF_B
38A						→				BYE	IBCF_B forwards BYE to IMS_B
39A							→			BYE	IMS_B forwards BYE to UE_B
40A								→			User B is informed that call has ended
41A							←			200 OK	UE_B sends 200 OK for BYE
42A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
43A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
44A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
45A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
46A	←										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	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	User A calls user B using barred user identity
	2	Verify that user A is informed that call cannot be established
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_05 in CFW step 13 (404 response): *ensure that {* *when { UE_A sends an initial INVITE to UE_B and* *IMS_A sends the INVITE to IMS_B* *containing a Request_URI* *indicating a barred_user in IMS_B }* *then { IMS_B sends 404_response to IMS_A }* *}*

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7			←	←						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12						←				404 Not Found	**IMS_B responds to the INVITE with 404 Not Found**
13					←					404 Not Found	IBCF_B forwards 404 Not Found response to IBCF_A
14			←	←						404 Not Found	IBCF_A forwards 404 Not Found response to IMS_A
15		←								404 Not Found	**IMS_A forwards** 404 Not Found **response to UE_A**
16	←										User A is informed that call has failed
17		→								ACK	UE_A acknowledges the response
18			→	→						**ACK**	**IMS_A forwards ACK to IBCF_A**
19					→					ACK	IBCF_A forwards ACK to IBCF_B
20						→				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 13 (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	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			—	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7			←	—						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12						←				404 Not Found	**IMS_B responds to the INVITE with 404 Not Found**
13					←					404 Not Found	IBCF_B forwards 404 Not Found response to IBCF_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
14			←							404 Not Found	IBCF_A forwards 404 Not Found response to IMS_A
15		←								404 Not Found	**IMS_A forwards** 404 Not Found **response to UE_A**
16	←										User A is informed that call has failed
17		→								ACK	UE_A acknowledges the response
18			→		→					**ACK**	**IMS_A forwards ACK to IBCF_A**
19						→				ACK	IBCF_A forwards ACK to IBCF_B
20							→			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 13 (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	ENUMDB	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

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
4			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			—	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7			←	—						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12						←				4xx	**IMS_B responds to the INVITE with 4xx**
13					←					4xx	IBCF_B forwards 4xx response to IBCF_A
14			←	—						4xx	IBCF_A forwards 4xx response to IMS_A
15		←								4xx	**IMS_A forwards** 4xx **response to UE_A**
16	←										User A is informed that call has failed
17		→								ACK	UE_A acknowledges the response
18			—	→						**ACK**	**IMS_A forwards ACK to IBCF_A**
19					→					ACK	IBCF_A forwards ACK to IBCF_B
20						→				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 1st 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 13 (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	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6					→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→				INVITE	IBCF_A forwards INVITE to IBCF_B
9						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
10							→			INVITE	IBCF_B forwards INVITE to IMS_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12						←				408 Request Timeout or	**IMS_B responds to the INVITE with 4xx**
13					←					408 Request Timeout or	IBCF_B forwards 4xx response to IBCF_A
14				←						408 Request Timeout or	IBCF_A forwards 4xx response to IMS_A
15			←							408 Request Timeout or	**IMS_A forwards** 4xx **response to UE_A**
16	←										User A is informed that called user is not reachable

4.5.3.1.2 Dialogue Procedures with Roaming

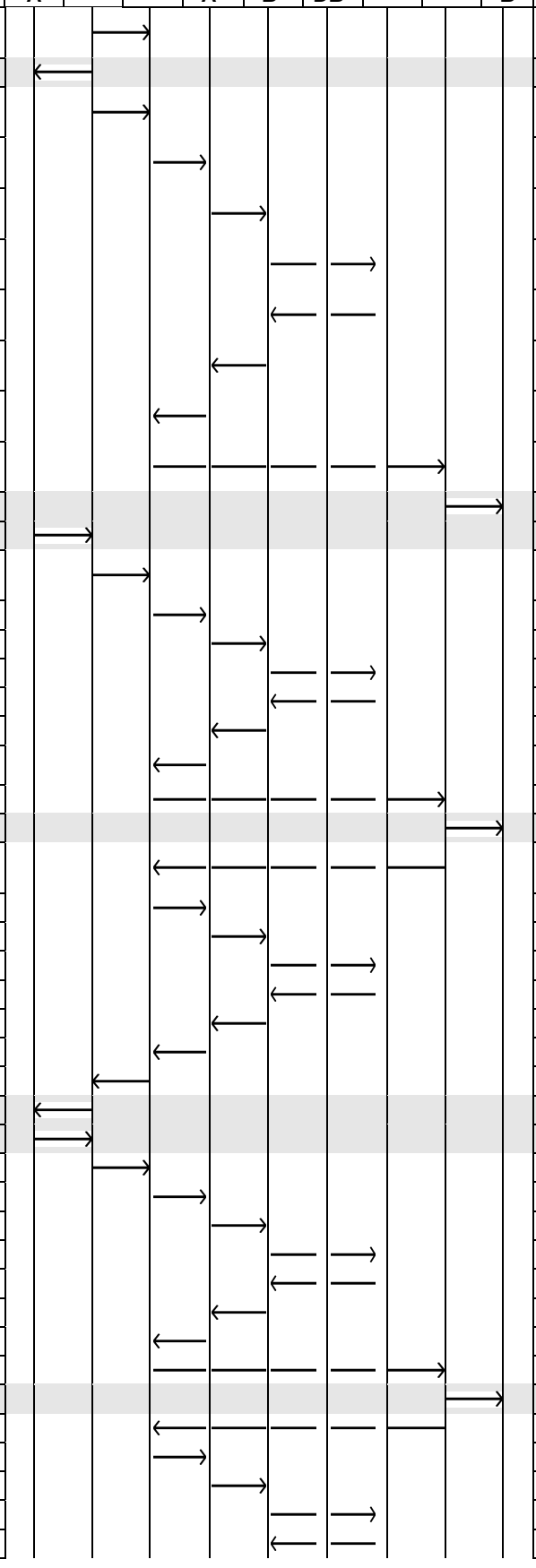
4.5.3.1.2.1 Normal call

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 (8th 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 15 (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 52A (BYE) *ensure that {* *when { IUT receives a BYE from UE_A* *}* *then { IUT sends the BYE to IMS_B* *containing no Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a topmost Record-Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *}* *}*
	4	TP_IMS_5055_01 in CFW step 23 (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 33 (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 14 (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	ENUM DB	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 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						←				ENUM	IMS B sends query to ENUM DB
11						→				ENUM	ENUM DB sends response to IMS B
12					←					INVITE	IMS_B forwards INVITE to IBCF_B
13										100 Trying	IBCF_B responds with a 100 Trying provisional response
14				←						INVITE	IBCF_B forwards INVITE to IBCF_A
15				→						100 Trying	IBCF_A responds with a 100 Trying provisional response
16			←							INVITE	IBCF_A forwards INVITE to IMS_A
17			→							100 Trying	IMS_A responds with a 100 Trying provisional response
18		←								INVITE	IMS_A forwards INVITE to UE_A



Step	Direction									Message	Comment
	User A	UE A	IMS A	IBCF A	IBCF B	ENUM DB	IMS B	UE B	User B		
19		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
20	←										User A is informed of incoming call of User B
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 180 Ringing response to IBCF_A
23				→						180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
24					→	→				180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
25					←	←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
26				←						180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
27			←							180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
28			→	→	→	→	→			180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
29								→	→		User B is informed that UE_A is ringing
30	→										User A answers call
31		→								200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
32			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
33				→						200 OK	IBCF_A forwards 200 OK response to IBCF_B
34					→	→				200 OK	IBCF_B forwards 200 OK response 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 UE_B
39								→	→		User B is presented that call in process
40			←	←	←	←	←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
41			→							ACK	IMS_A forwards ACK to IBCF_A
42				→						ACK	IBCF_A forwards ACK to IBCF_B
43					→	→				ACK	IBCF_B forwards ACK to IMS_B
44					←	←				ACK	IMS_B forwards ACK to IBCF_B
45				←						ACK	IBCF_B forwards ACK to IBCF_A
46			←							ACK	IBCF_A forwards ACK to IMS_A
47		←								ACK	IMS_A forwards ACK to UE_A
48	←										User A is informed that the call is in progress
49A	→										User A ends call
50A		→								BYE	UE_A releases the call with BYE
51A			→							BYE	IMS_A forwards BYE to IBCF_A
52A				→						BYE	IBCF_A forwards BYE to IBCF_B
53A					→	→				BYE	IBCF_B forwards BYE to IMS_B
54A					←	←				BYE	IMS_B forwards BYE to IBCF_B
55A				←						BYE	IBCF_B forwards BYE to IBCF_A
56A			←							BYE	IBCF_A forwards BYE to IMS_A
57A			→	→	→	→	→			BYE	IMS_A forwards BYE to UE_B
58A								→	→		User B is informed that call has ended
59A			←	←	←	←	←			200 OK	UE_B sends 200 OK for BYE
60A			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61A				→						200 OK	IBCF_A forwards 200 OK response to IBCF_B
62A					→	→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63A					←	←				200 OK	IMS_B forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
64A				←						200 OK	IBCF_B forwards 200 OK response to IBCF_A
65A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
67A	←										User A 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 6th 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 61A and 96A (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 69A and 104A (200 OK): *ensure that {* *when { IMS_A receives a 200_response from UE_B }* *then { IMS_A sends the 200_response to IMS_B containing a P-Charging-Vector_header containing an updated access-network-charging-info_parameter*

Interoperability Test Description		
		} *}*
	3	TP_IMS_5120_01 in CFW step 60A and 95A (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
48								→			User B is presented that call is in progress
49A	→										User A puts call on hold
50A		→								INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
52A			→	→						INVITE	IMS_A forwards INVITE to IBCF_A
53A			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
54A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
55A					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
56A						→				INVITE	IBCF_B forwards INVITE to IMS_B
57A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
58A						←				INVITE	IMS_B forwards INVITE to IBCF_B
59A						→				100 Trying	IBCF_B responds with a 100 Trying provisional response
60A					←					INVITE	IBCF_B forwards INVITE to IBCF_A
61A					→					100 Trying	IBCF_A responds with a 100 Trying provisional response
62A			←	←						INVITE	IBCF_A forwards INVITE to IMS_A
63A			→	→						100 Trying	IMS_A responds with a 100 Trying provisional response
64A			→	→	→	→	→			INVITE	IMS_A 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 on hold
67A			←	←	←	←	←			200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
68A			→	→	→					200 OK	IMS_A forwards 200 OK response to IBCF_A
69A					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
70A						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
71A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
72A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
73A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
74A		←								200 OK	IMS_A forwards 200 OK response to UE_A
75A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
76A			→		→					ACK	IMS_A forwards ACK to IBCF_A
77A						→				ACK	IBCF_A forwards ACK to IBCF_B
78A							→			ACK	IBCF_B forwards ACK to IMS_B
79A							←			ACK	IMS_B forwards ACK to IBCF_B
80A						←				ACK	IBCF_B forwards ACK to IBCF_A
81A			←							ACK	IBCF_A forwards ACK to IMS_A
82A			→		→	→	→	→		ACK	IMS_A forwards ACK to UE_B
83A	←	←									User A is informed that call is on hold
84A	→	→									User A resumes call
85A		→								INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
86A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
87A			→		→					INVITE	IMS_A forwards INVITE to IBCF_A
88A			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
89A						→				INVITE	IBCF_A forwards INVITE to IBCF_B
90A						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
91A							→			INVITE	IBCF_B forwards INVITE to IMS_B
92A							←			100 Trying	IMS_B responds with a 100 Trying provisional response
93A							←			INVITE	IMS_B forwards INVITE to IBCF_B
94A							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
95A						←				INVITE	IBCF_B forwards INVITE to IBCF_A
96A						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
97A			←		←					INVITE	IBCF_A forwards INVITE to IMS_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
98A			→		→					100 Trying	IMS_A responds with a 100 Trying provisional response
99A			→		→	→	→	→		INVITE	IMS_A forwards INVITE to UE_B
100 A			←		→	→	→	→		100 Trying	UE_B optionally responds with a 100 Trying provisional response
101 A								→			User B is informed that call is resumed
102 A			←		→	→	→	→		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
103 A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
104 A					→	→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
105 A						→	→			200 OK	IBCF_B forwards 200 OK response to IMS_B
106 A						←	←			200 OK	IMS_B forwards 200 OK response to IBCF_B
107 A					←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
108 A			←		←					200 OK	IBCF_A forwards 200 OK response to IMS_A
109 A		←	←							200 OK	IMS_A forwards the 200 OK response to UE_A
110 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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5052_01 in CFW step 52B (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	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
50B	←	←	←	←	←	←	←	←		BYE	UE_B releases the call with BYE
51B			→	←	←	←	←	←		BYE	IMS_A forwards BYE to IBCF_A
52B				→	←	←	←	←		BYE	IBCF_A forwards BYE to IBCF_B
53B					→	←	→	←		BYE	IBCF_B forwards BYE to IMS_B
54B					←	←	←	←		BYE	IMS_B forwards BYE to IBCF_B
55B				←	←	←	←	←		BYE	IBCF_B forwards BYE to IBCF_A
56B			←	←	←	←	←	←		BYE	IBCF_A forwards BYE to IMS_A
57B		←	←	←	←	←	←	←		BYE	IMS_A forwards BYE to UE_A
58B	←	←									User A is informed that call has ended
59B		→	→	→	→	→	→	→		200 OK	UE_A sends 200 OK for BYE
60B			→	→	→	→	→	→		200 OK	IMS_A forwards 200 OK response to IBCF_A
61B				→	→	→	→	→		200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B					→	→	→	→		200 OK	IBCF_B forwards 200 OK response to IMS_B
63B					←	→	→	→		200 OK	IMS_B forwards 200 OK response to IBCF_B
64B				←	←	→	→	→		200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←	←	←	→	→	→		200 OK	IBCF_A forwards 200 OK response to IMS_A
66B			→	→	→	→	→	→	→	200 OK	IMS_A forwards the 200 OK response to UE_B
67B									→		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	

Interoperability Test Description		
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 54B and 89B (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 54B and 89B (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
49B								←			User B puts call on hold
50B			←							INVITE	UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51B			→					→		100 Trying	IMS_A responds with a 100 Trying provisional response
52B			→	→						INVITE	IMS_A forwards INVITE to IBCF_A
53B			←							100 Trying	IBCF_A responds with a 100 Trying provisional response
54B					→					INVITE	IBCF_A forwards INVITE to IBCF_B
55B					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
56B						→				INVITE	IBCF_B forwards INVITE to IMS_B
57B						←				100 Trying	IMS_B responds with a 100 Trying provisional response

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
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_A 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 on hold
67B		→	←							200 OK	UE_A responds to INVITE with 200 OK indicating attribute "recvonly" inactive
68B			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
69B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
70B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
71B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
72B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
73B			←	←						200 OK	IBCF_A forwards 200 OK response to IMS_A
74B			→	→	→	→	→	→		200 OK	IMS_A forwards 200 OK response to UE_B
75B			←	←	←	←	←	←		ACK	UE_B acknowledges the receipt of 200 OK for INVITE
76B			→	→						ACK	IMS_A forwards ACK to IBCF_A
77B					→					ACK	IBCF_A forwards ACK to IBCF_B
78B						→				ACK	IBCF_B forwards ACK to IMS_B
79B						←				ACK	IMS_B forwards ACK to IBCF_B
80B					←					ACK	IBCF_B forwards ACK to IBCF_A
81B			←	←						ACK	IBCF_A forwards ACK to IMS_A
82B		←	←							ACK	IMS_A forwards ACK to UE_A
83B	←	←									User A is informed that call is on hold
84B								←			User B resumes call

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

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

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0011	
Summary:	IMS network handles subsequent UPDATEs correctly in case of a user initiated call hold and resume when roaming caller puts a home user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT:	IMS_A	
References:	**Test Purpose**	**Specification Reference**
	TP_IMS_5080_02	TS 124 229 [1], clause 5.2.9.1 ¶2
Use Case ref.:	UC_04_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}* *}*

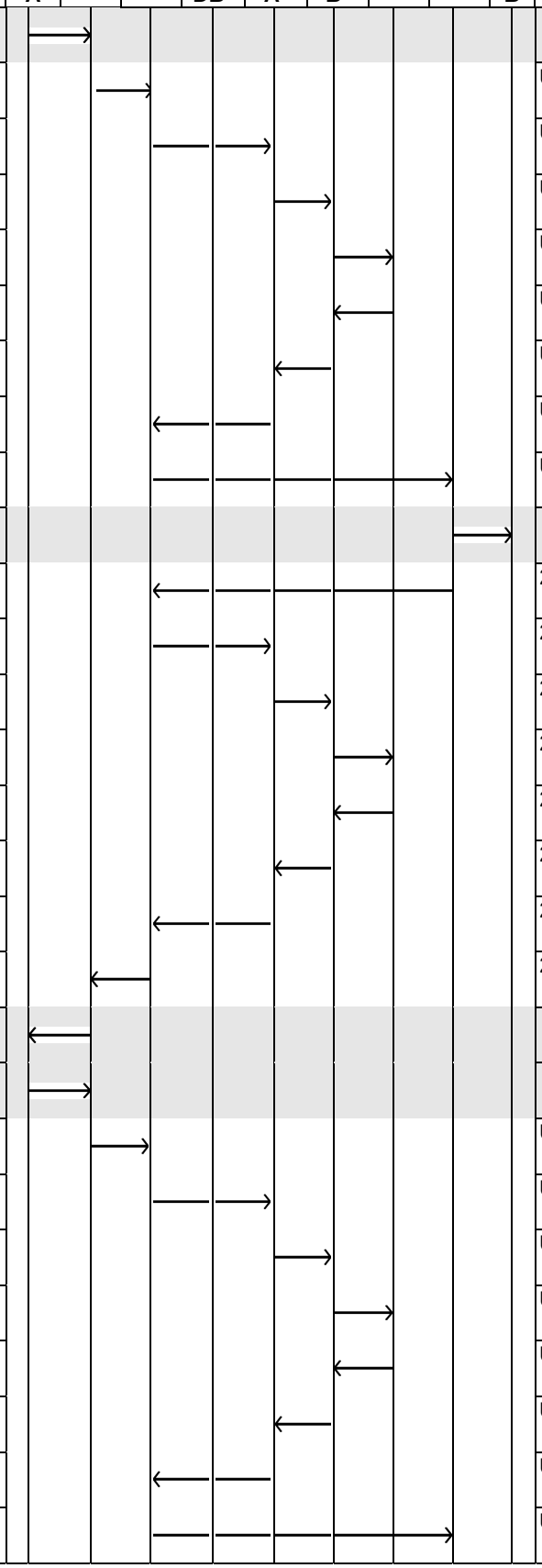
Step	Direction									Message	Comment
	User A	**UEA**	**IMSA**	**ENUMDB**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
49B								←			User B puts call on hold
50B			←							UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
51B			→	→						UPDATE	IMS_A forwards UPDATE to IBCF_A
52B					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
53B						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
54B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
55B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
56B			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
57B		←								UPDATE	IMS_A forwards UPDATE to UE_A
58B	←										User A is informed that call is on hold
59B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
60B			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
61B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
64B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
66B			→		→	→	→			200 OK	IMS_A forwards 200 OK response to UE_B
67B								→			User B is informed that call is on hold
68B								←			User B resumes call
69B			←		←	←	←			UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
70B			→		→					UPDATE	IMS_A forwards UPDATE to IBCF_A
71B						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
72B							→			UPDATE	IBCF_B forwards UPDATE to IMS_B
73B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
74B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
75B			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
76B		←								UPDATE	IMS_A forwards UPDATE to UE_A
77B	←										User A is informed that call is resumed
78B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
79B			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
80B						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
81B							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
82B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
83B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
84B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
85B			—	—	—	—	→			200 OK	IMS_A forwards the 200 OK response to UE_B
86B											User B is informed that call is resumed

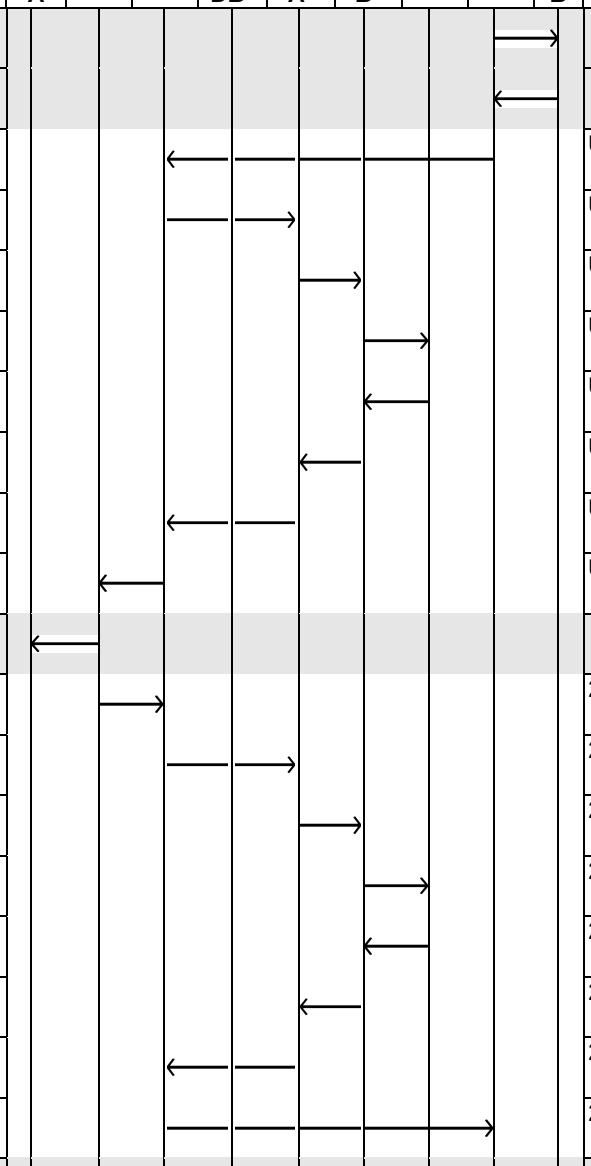
4.5.3.1.2.6 Subsequent target refresh request (UPDATE), home user initiated

Interoperability Test Description		
Identifier:	TD_IMS_CALL_0012	
Summary:	IMS network handles subsequent UPDATEs correctly in case of a user initiated call hold and resume when home caller puts a roaming user on hold and resumes call	
Configuration:	CF_ROAM_CALL	
SUT:	IMS_A	
References:	**Test Purpose**	**Specification Reference**
	TP_IMS_5120_02	TS 124 229 [1], clause 5.4.3.3 ¶99 (item 3 and 5 in 6th 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
Conformance Criteria:	**Check**	
	1	TP_IMS_5120_02 in CFW step 55A and 74A (UPDATE): *ensure that {* *when { UE_A sends an UPDATE to UE_B }* *then { IMS_A receives the UPDATE from IMS_B* *containing a topmost Route_header* *not indicating the S-CSCF_SIP_URI* *containing a Record-Route_header* *containing the S-CSCF_SIP_URI }* *}*



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
49A											User A puts call on hold
50A										UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
51A										UPDATE	IMS_A forwards UPDATE to IBCF_A
52A										UPDATE	IBCF_A forwards UPDATE to IBCF_B
53A										UPDATE	IBCF_B forwards UPDATE to IMS_B
54A										UPDATE	IMS_B forwards UPDATE to IBCF_B
55A										UPDATE	IBCF_B forwards UPDATE to IBCF_A
56A										UPDATE	IBCF_A forwards UPDATE to IMS_A
57A										UPDATE	IMS_A forwards UPDATE to UE_B
58A											User B is informed that call is on hold
59A										200 OK	UE_B responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
60A										200 OK	IMS_A forwards 200 OK response to IBCF_A
61A										200 OK	IBCF_A forwards 200 OK response to IBCF_B
62A										200 OK	IBCF_B forwards 200 OK response to IMS_B
63A										200 OK	IMS_B forwards 200 OK response to IBCF_B
64A										200 OK	IBCF_B forwards 200 OK response to IBCF_A
65A										200 OK	IBCF_A forwards 200 OK response to IMS_A
66A										200 OK	IMS_A forwards 200 OK response to UE_A
67A											User A is informed that call is on hold
68A											User A resumes call
69A										UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
70A										UPDATE	IMS_A forwards UPDATE to IBCF_A
71A										UPDATE	IBCF_A forwards UPDATE to IBCF_B
72A										UPDATE	IBCF_B forwards UPDATE to IMS_B
73A										UPDATE	IMS_B forwards UPDATE to IBCF_B
74A										UPDATE	IBCF_B forwards UPDATE to IBCF_A
75A										UPDATE	IBCF_A forwards UPDATE to IMS_A
76A										UPDATE	IMS_A forwards UPDATE to UE_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
77A								→			User B is informed that call is resumed
78A			←							200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
79A			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
80A					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
81A						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
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 call has resumed
49B								←			User B puts call on hold
50B			←							UPDATE	UE_B sends UPDATE message indicating media attribute "sendonly" (Call Hold)
51B			→	→						UPDATE	IMS_A forwards UPDATE to IBCF_A
52B					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
53B						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
54B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
55B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
56B			←	←						UPDATE	IBCF_A forwards UPDATE to IMS_A
57B		←								UPDATE	IMS_A forwards UPDATE to UE_A
58B	←										User A is informed that call is on hold
59B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating attribute "recvonly" inactive
60B			→	→						200 OK	IMS_A forwards 200 OK response to IBCF_A
61B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
62B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
63B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
64B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
65B			←	←						200 OK	IBCF_A forwards 200 OK response to IMS_A
66B			→	→	→	→	→			200 OK	IMS_A forwards 200 OK response to UE_B



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
67B								→			User B is informed that call is on hold
68B								←			User B resumes call
69B			←							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
70B				→						UPDATE	IMS_A forwards UPDATE to IBCF_A
71B					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
72B						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
73B						←				UPDATE	IMS_B forwards UPDATE to IBCF_B
74B					←					UPDATE	IBCF_B forwards UPDATE to IBCF_A
75B			←							UPDATE	IBCF_A forwards UPDATE to IMS_A
76B		←								UPDATE	IMS_A forwards UPDATE to UE_A
77B	←										User A is informed that call is resumed
78B		→								200 OK	UE_A responds to UPDATE with 200 OK indicating media attribute "sendrecv"
79B			→							200 OK	IMS_A forwards 200 OK response to IBCF_A
80B					→					200 OK	IBCF_A forwards 200 OK response to IBCF_B
81B						→				200 OK	IBCF_B forwards 200 OK response to IMS_B
82B						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
83B					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
84B			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
85B			→		→	→	→	→		200 OK	IMS_A forwards the 200 OK response to UE_B
86B											User B is informed that call is resumed

4.5.3.1.3 Subsequent Request Procedures - Originating Network

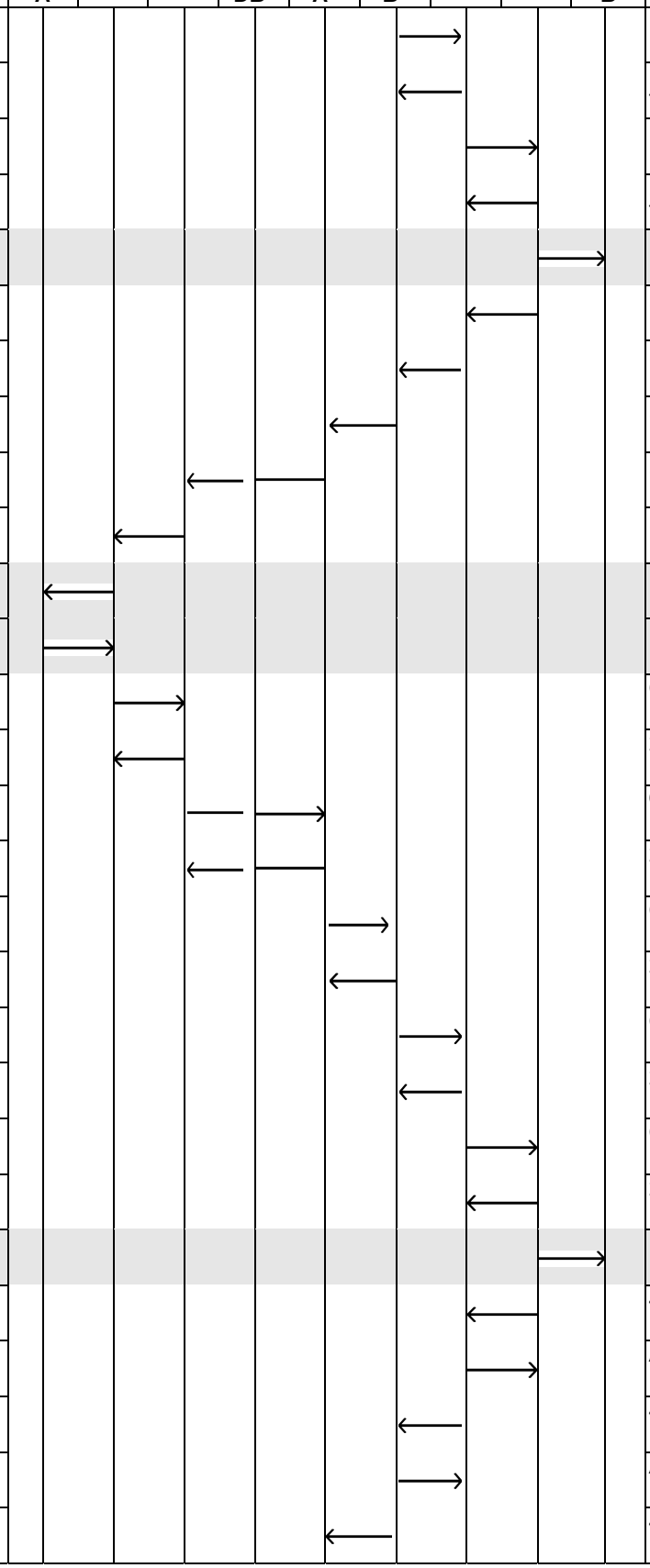
4.5.3.1.3.1 Call CANCEL by calling user

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 6th 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	

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 26 (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	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
5				←						ENUM	ENUM DB sends response to IMS_A
6					→					INVITE	IMS_A forwards INVITE to IBCF_A
7					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→				INVITE	IBCF_A forwards INVITE to IBCF_B
9						←				100 Trying	IBCF_B responds with a 100 Trying provisional response


Step
Direction
User A
UE A
IMS A
ENUM DB
IBCF A
IBCF B
IMS B
UE B
User B
Message
Comment
10 INVITE IBCF_B forwards INVITE to IMS_B
11 100 Trying IMS_B responds with a 100 Trying provisional response
12 INVITE IMS_B forwards INVITE to UE_B
13 100 Trying UE_B optionally responds with a 100 Trying provisional response
14 User B is informed of incoming call of User A
15 180 Ringing UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16 180 Ringing IMS_B forwards 180 Ringing response to IBCF_B
17 180 Ringing IBCF_B forwards 180 Ringing response to IBCF_A
18 180 Ringing IBCF_A forwards 180 Ringing response to IMS_A
19 180 Ringing IMS_A forwards the 180 Ringing response to UE_A
20 User A is informed that UE_B is ringing
21 User A cancels the call
22 CANCEL UE_A sends a CANCEL to IMS_A
23 200 OK IMS_A responds with a 200 OK to UE_A
24 CANCEL IMS_A forwards the CANCEL to IBCF_A
25 200 OK IBCF_A responds with a 200 OK to IMS_A
26 CANCEL IBCF_A forwards the CANCEL to IBCF_B
27 200 OK IBCF_B responds with a 200 OK to IBCF_A
28 CANCEL IBCF_B forwards the CANCEL to IMS_B
29 200 OK IMS_B responds with a 200 OK to IBCF_B
30 CANCEL IMS_B forwards the CANCEL to UE_B
31 200 OK UE_B responds with a 200 OK to IMS_B
32 User B is informed that call has been cancelled
33 487 Request UE_B sends 487 Request Terminated to IMS_B
34 ACK IMS_B responds with ACK to UE_B
35 487 Request IMS_B forwards the 487 Request Terminated to IBCF_B
36 ACK IBCF_B responds with ACK to IMS_B
37 487 Request IBCF_B forwards the 487 Request Terminated to IBCF_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
38						→				ACK	IBCF_A responds with ACK to IBCF_B
39					←					487 Request	IBCF_A forwards the 487 Request Terminated to IMS_A
40					→					ACK	IMS_A responds with ACK to IBCF_A
41			←							487 Request	IMS_A forwards the 487 Request Terminated to UE_A
42			→							ACK	UE_A responds with ACK to IMS_A
43	←										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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5073_01 in CFW step 36 (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
21	→										User A answers call
22		→								200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
23			→	→						200 OK	**IMS_A forwards the 200 OK response to IBCF_A**
24					→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
25						→				200 OK	IBCF_B forwards the 200 OK response to IMS_B
26							→			200 OK	IMS_B forwards the 200 OK to UE_B
27								→			User B is presented that call in process
28							←			ACK	UE_B acknowledges the receipt of 200 OK for INVITE
29						←				ACK	IMS_B forwards ACK to IBCF_B
30					←					ACK	IBCF_B forwards ACK to IBCF_A
31			←							ACK	IBCF_A forwards ACK to IMS_A
32		←								ACK	IMS_A forwards ACK to UE_A
33	←										User A is informed that the call is in progress
34											UE_B looses connectivity
35						←				BYE	IMS_B forwards BYE to IBCF_B
36					←					BYE	IBCF_B forwards BYE to IBCF_A

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
37			←							BYE	IBCF_A forwards BYE to IMS_A
38		←								BYE	IMS_A forwards BYE to UE_A
39	←										User A is informed that call has ended
40		→								200 OK	UE_A sends 200 OK for BYE
41				→						200 OK	**IMS_A forwards the 200 OK response to IBCF_A**
42					→					200 OK	IBCF_A forwards the 200 OK response to IBCF_B
43						→				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 { IUT receives a 'network internal indication that the lifetime of the last public user identity has expired ' from NWK* *}* *then { IUT sends a BYE to UE_B* *containing a Request_URI indicating Contact_header_value of UE_B* *and* *containing a To_header indicating* *'the To header of the 200 response to_ initial INVITE' and* *containing a From_header indicating* *the From_header of the initial INVITE and*

Interoperability Test Description
containing a Call-ID_header indicating *the Call-ID_header of the initial INVITE and* *containing a CSeq_header indicating* *'CSeq_header of the calling user incremented by one' and* *containing a Route_header indicating* *'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'* *and* *IUT sends a BYE to UE_A* *containing a Request_URI indicating Contact_header_value of UE_A* *and* *containing a To_header indicating* *'the To header of the 200 response to_ initial INVITE' and* *containing a From_header indicating* *the From_header of the initial INVITE and* *containing a Call-ID_header indicating* *the Call-ID_header of the initial INVITE and* *containing a CSeq_header indicating* *'CSeq_header of the called user incremented by one' and* *containing a Route_header indicating* *'routeing information towards the calling 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	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
21								←			User B answers call
22							←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
23						←				200 OK	**IMS_B forwards the 200 OK response to IBCF_B**
24					←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
25			←							200 OK	IBCF_A forwards the 200 OK response to IMS_A
26		←								200 OK	IMS_A forwards the 200 OK to UE_A
27	←										User A is presented that call in process
28		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
29			→		→					ACK	IMS_A forwards ACK to IBCF_A
30					→					ACK	IBCF_A forwards ACK to IBCF_B
31						→				ACK	IBCF_B forwards ACK to IMS_B
32							→			ACK	IMS_B forwards ACK to UE_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
33								→			User B is informed that the call is in progress
34											UE_A is forced to be de-registered in IMS_A
35			→	→						BYE	IMS_A forwards BYE to IBCF_A
36					→					BYE	IBCF_A forwards BYE to IBCF_B
37						→				BYE	IBCF_B forwards BYE to IMS_B
38							→			BYE	IMS_B forwards BYE to UE_B
39								→			User B is informed that call has ended
40							←			200 OK	UE_B sends 200 OK for BYE
41						←				200 OK	**IMS_B forwards the 200 OK response to IBCF_B**
42					←					200 OK	IBCF_B forwards the 200 OK response to IBCF_A
43			←	—						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 (5th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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	

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_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 39A and 62A (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 48A and 71A (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
34A		→									User A puts call on hold
35A		→	→							INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
36A		←	←							100 Trying	IMS_A responds with a 100 Trying provisional response
37A			→	→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
38A			←	←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
39A					→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
40A					←	←				100 Trying	IBCF_A responds with a 100 Trying provisional response
41A						→	→			INVITE	IBCF_B forwards INVITE to IMS_B
42A						←	←			100 Trying	IMS_B responds with a 100 Trying provisional response

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
43A							→	→		INVITE	IMS_B forwards INVITE to UE_B
44A							←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A								→	→		User B is informed that call is on hold
46A							←	←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "recvonly"
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 A is informed that call is on hold
52A		→	→							ACK	UE_A acknowledges the receipt of 200 OK for INVITE
53A			→	→	→					ACK	IMS_A forwards ACK to IBCF_A
54A					→	→				ACK	IBCF_A forwards ACK to IBCF_B
55A						→	→			ACK	IBCF_B forwards ACK to IMS_B
56A							→	→		ACK	IMS_B forwards ACK to UE_B
57A	→	→									User A resumes call
58A		→	→							INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
59A		←	←							100 Trying	IMS_A responds with a 100 Trying provisional response
60A			→	→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
61A			←	←	←					**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
62A					→	→				INVITE	IBCF_A forwards INVITE to IBCF_B
63A					←	←				100 Trying	IBCF_A responds with a 100 Trying provisional response
64A						→	→			INVITE	IBCF_B forwards INVITE to IMS_B
65A						←	←			100 Trying	IMS_B responds with a 100 Trying provisional response
66A							→	→		INVITE	IMS_B forwards INVITE to UE_B
67A							←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
68A								→	→		User B is informed that call is resumed
69A							←	←		200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
70A						←	←			200 OK	**IMS_B forwards 200 OK response to IBCF_B**

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User 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 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 (5th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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 37A and 50A (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 43A and 56A (200 OK): *ensure that {* *when { UE_B sends a 2xx_response to UE_A }* *then { IMS_A receives the 2xx_response* *containing a P-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
34A		→									User A puts call on hold
35A			→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
36A			—		→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
37A						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
38A							→			UPDATE	IBCF_B forwards UPDATE to IMS_B
39A								→		UPDATE	IMS_B forwards UPDATE to UE_B
40A									→		User B is informed that call is on hold
41A								←		200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "recvonly"
42A							←			200 OK	**IMS_B forwards 200 OK response to IBCF_B**
43A						←				200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
44A			←		—					**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
45A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
46A	←										User A is informed that call is on hold
47A	→										User A resumes call
48A		→								UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
49A			—		→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
50A						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
51A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
52A							→			UPDATE	IMS_B forwards UPDATE to UE_B
53A								→			User B is informed that call is resumed
54A							←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
55A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
56A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
57A			←							**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
58A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
59A	←										User A is informed that call is resumed

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 (5th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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 39A: *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 40A, 48A (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 55A, 73 (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**	**ENUMDB**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
34A	→										User A adds a new media stream
35A		→								INVITE	UE_A sends reINVITE message with new media stream in SDP
36A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
37A			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
38A			←							**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
39A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
40A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response

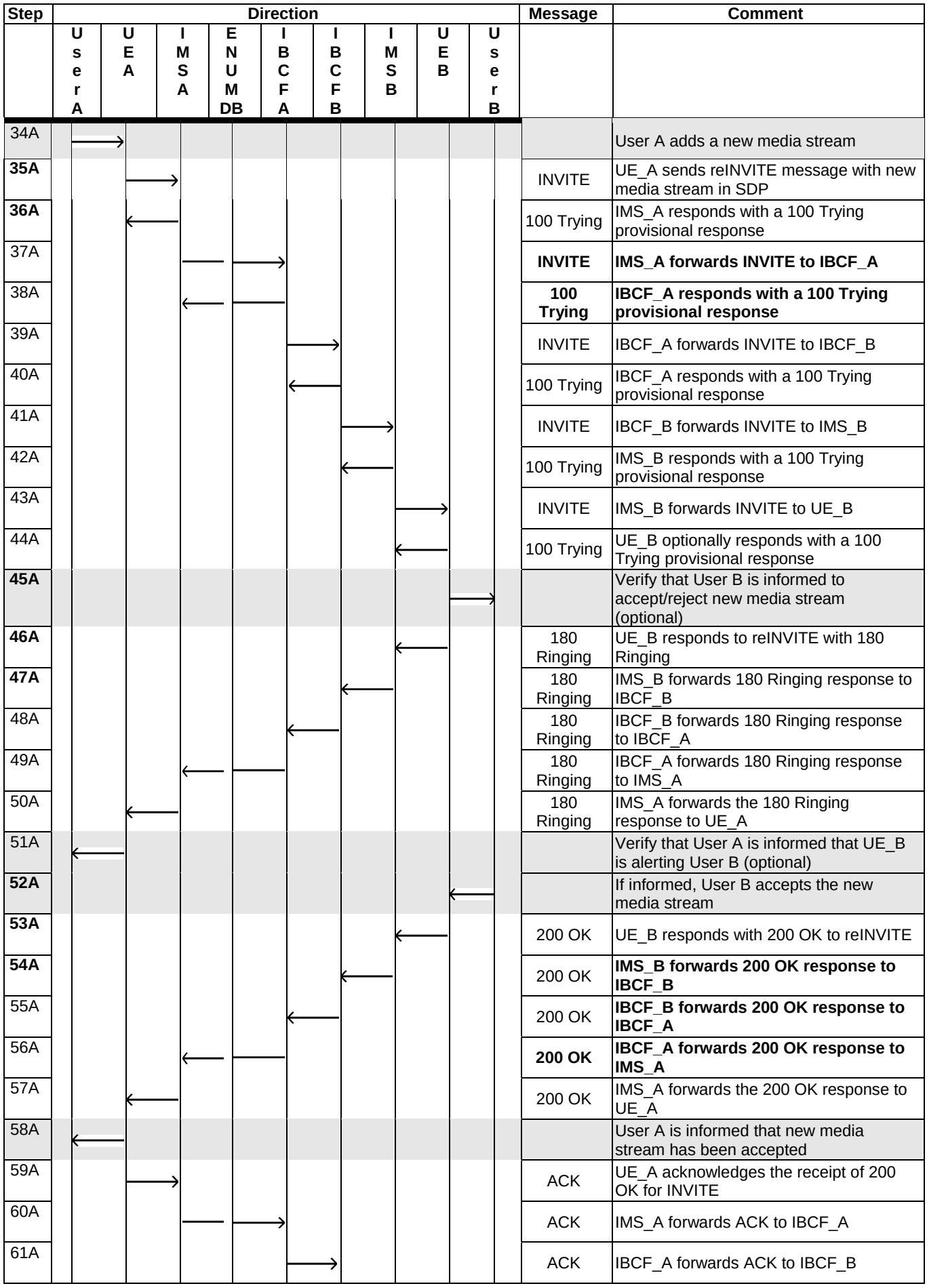
Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
41A						→				INVITE	IBCF_B forwards INVITE to IMS_B
42A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
43A							→			INVITE	IMS_B forwards INVITE to UE_B
44A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A								→			Verify that User B is informed to accept/reject new media stream (optional)
46A							←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
47A						←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
48A					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
49A			←	—						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
50A		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
51A	←										Verify that User A is informed that UE_B is alerting User B (optional)
52A								←			If informed, User B accepts the new media stream
53A							←			200 OK	UE_B responds with 200 OK to reINVITE
54A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
55A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
56A			←	—						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
57A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
58A	←										User A is informed that new media stream has been accepted
59A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
60A			—	→						ACK	IMS_A forwards ACK to IBCF_A
61A					→					ACK	IBCF_A forwards ACK to IBCF_B
62						→				ACK	IBCF_B forwards ACK to IMS_B
63							→			ACK	IMS_B forwards ACK to UE_B
64	→									BYE	User A releases the call
65		→								BYE	UE_A sends BYE to indicate that the call has ended
66			—	→						BYE	IMS_A forwards the BYE to IBCF_A
67					→					BYE	IBCF_A forwards the BYE to IBCF_B
68						→				BYE	IBCF_B forwards the BYE to IMS_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
69								→		BYE	IMS_B forwards the BYE to UE_B
70									→		User B is informed that call has ended
71								←		200 OK	UE_B responds to the BYE with 200 OK
72							←			**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
73						←				**200 OK**	**IBCF_B forwards the 200 OK response to IBCF_A**
74					←					**200 OK**	**IBCF_A forwards the 200 OK response to IMS_A**
76				←						200 OK	IMS_A forwards the 200 OK response to UE_A
77			←								User A is informed that call has ended

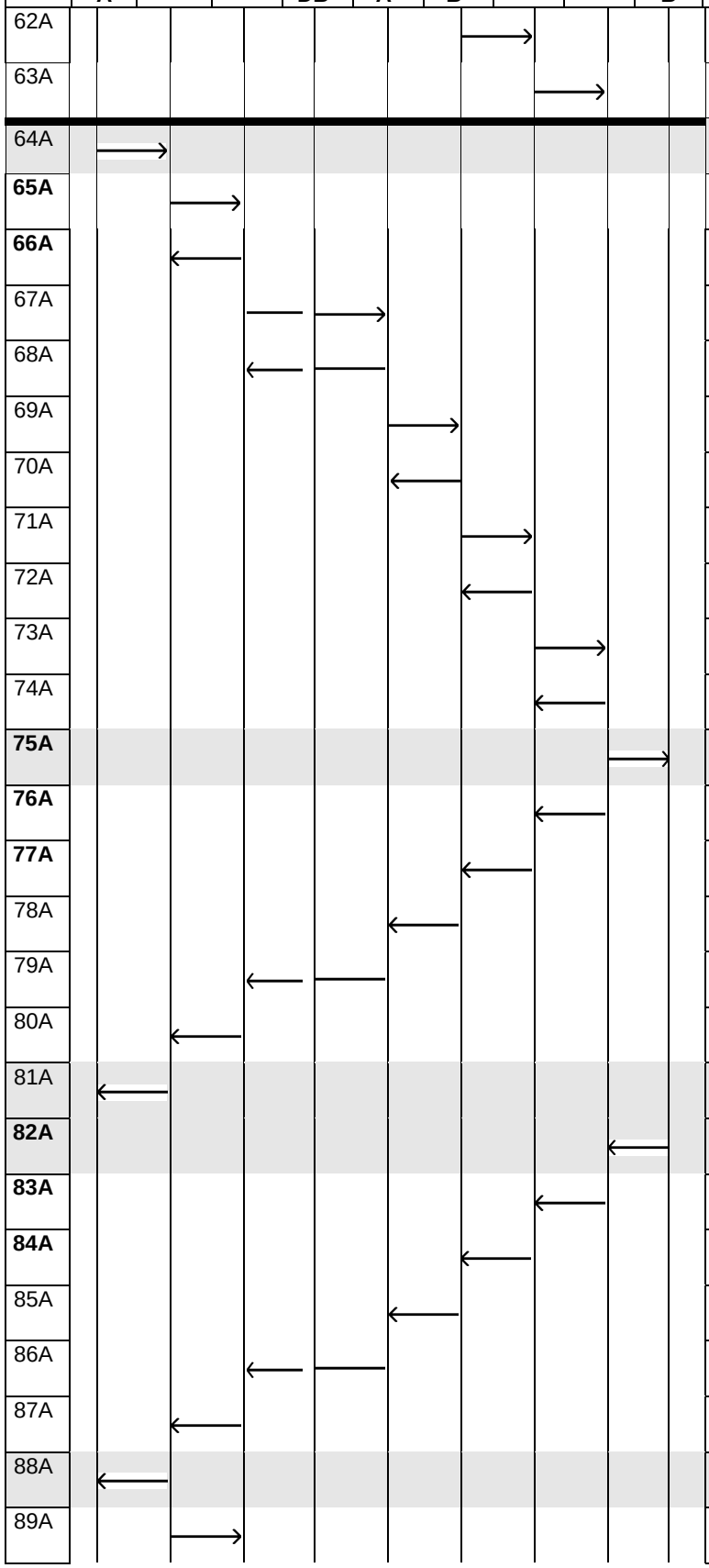
4.5.3.1.3.7 Modification of an existing media stream (reINVITE)

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 (5th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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 39A and 697A (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 40A, 70A (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 55A and 85A (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
34A	→										User A adds a new media stream
35A		→								INVITE	UE_A sends reINVITE message with new media stream in SDP
36A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
37A			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
38A			←	←						**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
39A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
40A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
41A						→				INVITE	IBCF_B forwards INVITE to IMS_B
42A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
43A							→			INVITE	IMS_B forwards INVITE to UE_B
44A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A								→			Verify that User B is informed to accept/reject new media stream (optional)
46A							←			180 Ringing	UE_B responds to reINVITE with 180 Ringing
47A						←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
48A					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
49A			←	←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
50A		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
51A	←										Verify that User A is informed that UE_B is alerting User B (optional)
52A								←			If informed, User B accepts the new media stream
53A							←			200 OK	UE_B responds with 200 OK to reINVITE
54A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
55A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
56A			←	←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
57A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
58A	←										User A is informed that new media stream has been accepted
59A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
60A			→	→						ACK	IMS_A forwards ACK to IBCF_A
61A					→					ACK	IBCF_A forwards ACK to IBCF_B



Step	Direction	Message	Comment
	User A / UEA / IMSA / ENUMDB / IBCFA / IBCFB / IMSB / UEB / User B		
62A	IBCF_B → IMS_B	ACK	IBCF_B forwards ACK to IMS_B
63A	IMS_B → UE_B	ACK	IMS_B forwards ACK to UE_B
64A			User A modifies the media stream
65A	UE_A → IMS_A	INVITE	UE_A sends reINVITE message with new media stream in SDP
66A	IMS_A → UE_A	100 Trying	IMS_A responds with a 100 Trying provisional response
67A	IMS_A → IBCF_A	**INVITE**	**IMS_A forwards INVITE to IBCF_A**
68A	IBCF_A → IMS_A	**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
69A	IBCF_A → IBCF_B	INVITE	IBCF_A forwards INVITE to IBCF_B
70A	IBCF_B → IBCF_A	100 Trying	IBCF_A responds with a 100 Trying provisional response
71A	IBCF_B → IMS_B	INVITE	IBCF_B forwards INVITE to IMS_B
72A	IMS_B → IBCF_B	100 Trying	IMS_B responds with a 100 Trying provisional response
73A	IMS_B → UE_B	INVITE	IMS_B forwards INVITE to UE_B
74A	UE_B → IMS_B	100 Trying	UE_B optionally responds with a 100 Trying provisional response
75A			Verify that User B is informed to accept/reject media stream modification
76A	UE_B → IMS_B	180 Ringing	UE_B responds to reINVITE with 180 Ringing
77A	IMS_B → IBCF_B	180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
78A	IBCF_B → IBCF_A	180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
79A	IBCF_A → IMS_A	180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
80A	IMS_A → UE_A	180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
81A	UE_A → User A		Verify that User A is informed that UE_B is alerting User B (optional)
82A	User B → UE_B		If informed, User B accepts the media stream modification
83A	UE_B → IMS_B	200 OK	UE_B responds with 200 OK to reINVITE
84A	IMS_B → IBCF_B	200 OK	**IMS_B forwards 200 OK response to IBCF_B**
85A	IBCF_B → IBCF_A	200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
86A	IBCF_A → IMS_A	**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
87A	IMS_A → UE_A	200 OK	IMS_A forwards the 200 OK response to UE_A
88A	UE_A → User A		User A is informed that media stream modification has been accepted
89A	UE_A → IMS_A	ACK	UE_A acknowledges the receipt of 200 OK for INVITE

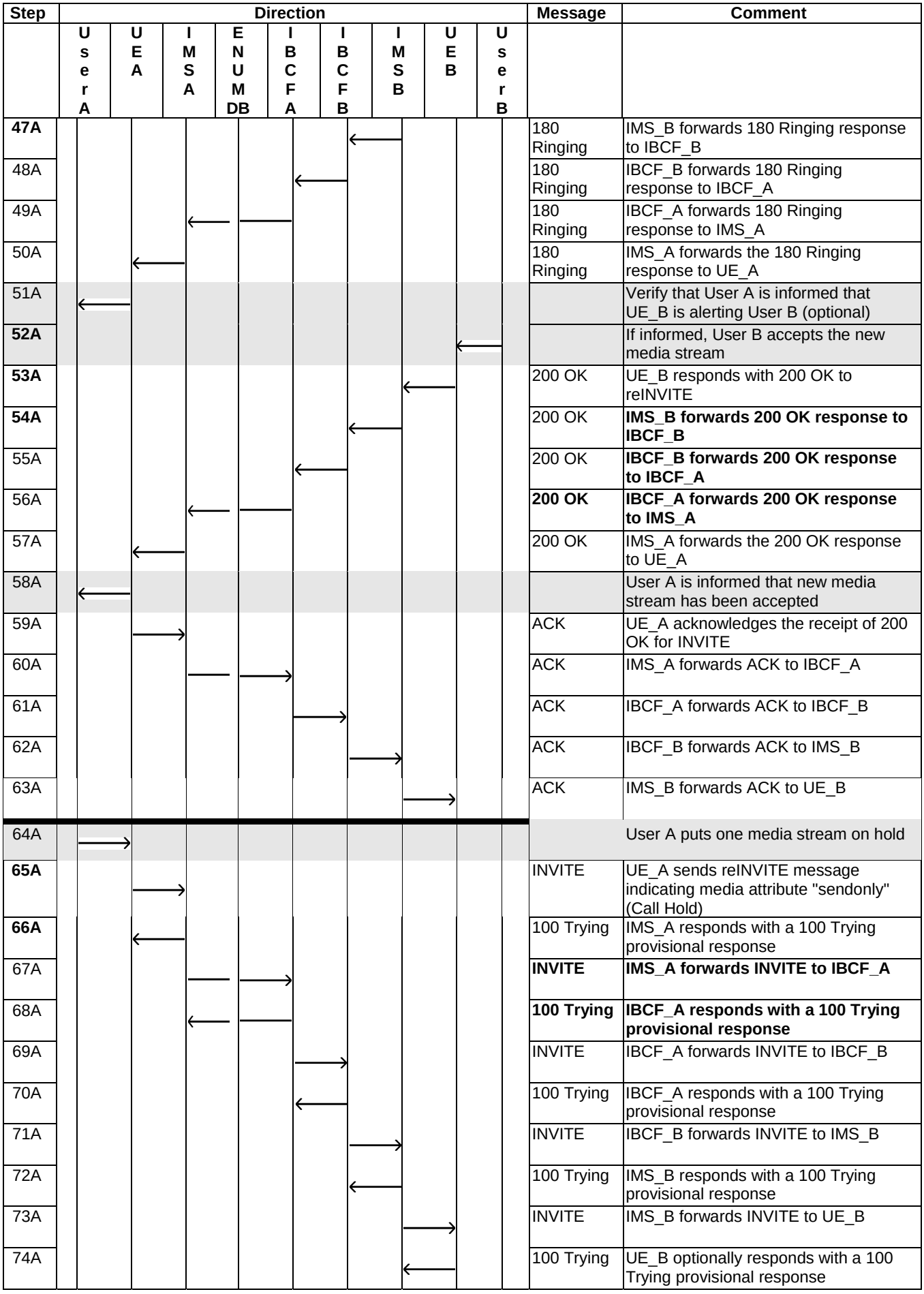
Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
90A			→	→						ACK	IMS_A forwards ACK to IBCF_A
91A					→					ACK	IBCF_A forwards ACK to IBCF_B
92A						→				ACK	IBCF_B forwards ACK to IMS_B
93A							→			ACK	IMS_B forwards ACK to UE_B
94								←		BYE	User B releases the call
95							←			BYE	UE_B sends BYE to indicate that the call has ended
96						←				BYE	IMS_B forwards the BYE to IBCF_B
97					←					BYE	IBCF_B forwards the BYE to IBCF_A
98			←							BYE	IBCF_A forwards the BYE to IMS_A
99		←								BYE	IMS_A forwards the BYE to UE_A
100	←										User A is informed that call has ended
101		→								200 OK	UE_A responds to the BYE with 200 OK
102			→	→						**200 OK**	**IMS_A forwards the 200 OK response to IBCF_A**
103					→					**200 OK**	**IBCF_A forwards the 200 OK response to IBCF_B**
104						→				**200 OK**	**IBCF_B forwards the 200 OK response to IMS_B**
105							→			200 OK	IMS_B forwards the 200 OK response to UE_B
106								→			User B is informed that call has ended

4.5.3.1.3.8 Hold/resume media streams (reINVITE)

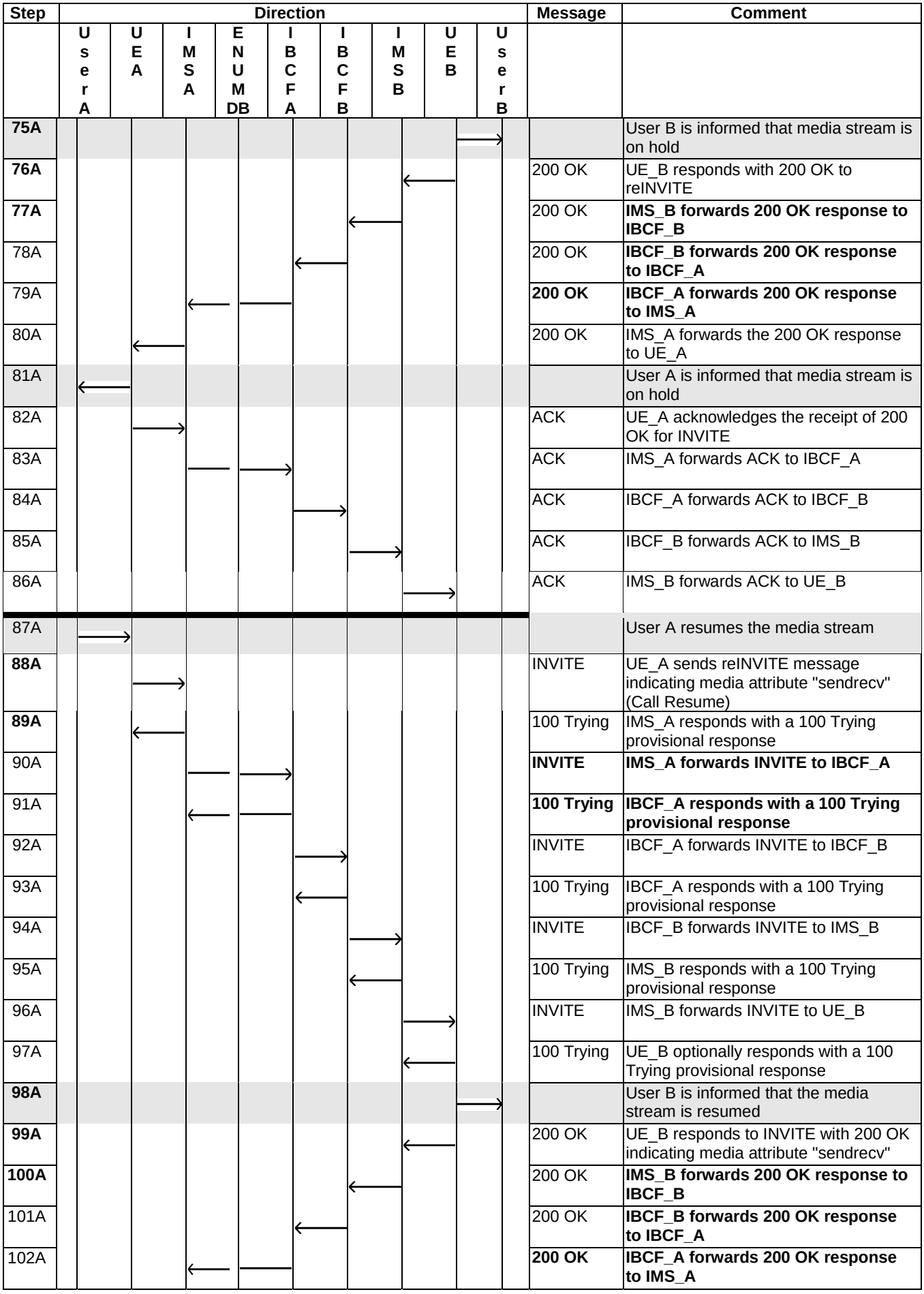
Interoperability Test Description		
Identifier:	TD_IMS_CALL_0021	
Summary:	IMS network handles subsequent INVITEs correctly during hold/resume of media streams	
Configuration:	CF_INT_CALL	
SUT:	IMS_A	
References:	**Test Purpose**	**Specification Reference**
	TP_IMS_5106_01	TS 124 229 [1], clause 5.4.3.2 ¶108 (5th numbered list)
	TP_IMS_5121_01	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5106_01 in CFW step 39A, 69A, 92A, 115A (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 40A, 70A, 93A, 114A, 116A (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 55A, 78A, 101A, 130A (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**	**ENUMDB**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
34A	→										User A adds a new media stream
35A		→								INVITE	UE_A sends reINVITE message with new media stream in SDP
36A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
37A			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
38A			←							**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
39A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
40A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
41A						→				INVITE	IBCF_B forwards INVITE to IMS_B
42A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
43A							→			INVITE	IMS_B forwards INVITE to UE_B
44A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
45A									→		Verify that User B is informed to accept/reject new media stream (optional)
46A							←			180 Ringing	UE_B responds to reINVITE with 180 Ringing



Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
47A						←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
48A					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
49A			←							180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
50A		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
51A	←										Verify that User A is informed that UE_B is alerting User B (optional)
52A								←			If informed, User B accepts the new media stream
53A							←			200 OK	UE_B responds with 200 OK to reINVITE
54A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
55A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
56A			←							**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
57A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
58A	←										User A is informed that new media stream has been accepted
59A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
60A			→							ACK	IMS_A forwards ACK to IBCF_A
61A					→					ACK	IBCF_A forwards ACK to IBCF_B
62A						→				ACK	IBCF_B forwards ACK to IMS_B
63A							→			ACK	IMS_B forwards ACK to UE_B
64A	→										User A puts one media stream on hold
65A		→								INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
66A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
67A			→							**INVITE**	**IMS_A forwards INVITE to IBCF_A**
68A			←							**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
69A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
70A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
71A						→				INVITE	IBCF_B forwards INVITE to IMS_B
72A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
73A							→			INVITE	IMS_B forwards INVITE to UE_B
74A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response



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

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
103A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
104A	←										User A is informed that media stream is resumed
105A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
106A			→	→						ACK	IMS_A forwards ACK to IBCF_A
107A					→					ACK	IBCF_A forwards ACK to IBCF_B
108A						→				ACK	IBCF_B forwards ACK to IMS_B
109A							→			ACK	IMS_B forwards ACK to UE_B
110A	→										User A removes one of the media streams
111A		→								INVITE	UE_A sends reINVITE to IMS_A
112A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
113A			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
114A			←							**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
115A					→					INVITE	IBCF_A forwards INVITE to IBCF_B
116A					←					100 Trying	IBCF_A responds with a 100 Trying provisional response
117A						→				INVITE	IBCF_B forwards INVITE to IMS_B
118A						←				100 Trying	IMS_B responds with a 100 Trying provisional response
119A							→			INVITE	IMS_B forwards INVITE to UE_B
120A							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
121A								→			User B is informed that the media stream has been removed
122A							←			180 Ringing	UE_B optionally responds to reINVITE with 180 Ringing
123A						←				180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
124A					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
125A			←							180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
126A		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
127A								←			User A may be informed that UE_B is alerting User B (optional)
128A							←			200 OK	UE_B responds to INVITE with 200 OK with SDP where the port number for
129A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
130A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
131A			←							**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
132A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
133A	←										User A is informed that new media stream has been removed
134A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
135A			→							ACK	IMS_A forwards ACK to IBCF_A
136A					→					ACK	IBCF_A forwards ACK to IBCF_B
137						→				ACK	IBCF_B forwards ACK to IMS_B
138							→			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 (5th numbered list)
	TP_IMS_5121_02	TS 124 229 [1], clause 5.4.3.3 ¶123 (7th 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	

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 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
	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 67A, 80A and 103A (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 73A, 86A and 109A (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**	**ENUMDB**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
64A		→									User A puts one media stream on hold
65A			→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendonly" (Call Hold)
66A				→	→					**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
67A						→				UPDATE	IBCF_A forwards UPDATE to IBCF_B
68A							→			UPDATE	IBCF_B forwards UPDATE to IMS_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
69A								→		UPDATE	IMS_B forwards UPDATE to UE_B
70A									→		User B is informed that media stream is on hold
71A								←		200 OK	UE_B responds with 200 OK to UPDATE
72A							←			200 OK	**IMS_B forwards 200 OK response to IBCF_B**
73A						←				200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
74A					←					**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
75A				←						200 OK	IMS_A forwards the 200 OK response to UE_A
76A			←								User A is informed that media stream is on hold
77A		→									User A resumes the media stream
78A			→							UPDATE	UE_A sends UPDATE message indicating media attribute "sendrecv" (Call Resume)
79A				→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
80A					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
81A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
82A							→			UPDATE	IMS_B forwards UPDATE to UE_B
83A								→			User B is informed that the media stream is resumed
84A							←			200 OK	UE_B responds to UPDATE with 200 OK indicating media attribute "sendrecv"
85A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
86A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
87A				←						**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
88A			←							200 OK	IMS_A forwards the 200 OK response to UE_A
99A		←									User A is informed that media stream is resumed
100 A		→									User A removes one of the media streams
101 A			→							UPDATE	UE_A sends UPDATE to IMS_A
102 A				→						**UPDATE**	**IMS_A forwards UPDATE to IBCF_A**
103 A					→					UPDATE	IBCF_A forwards UPDATE to IBCF_B
104 A						→				UPDATE	IBCF_B forwards UPDATE to IMS_B
105 A							→			UPDATE	IMS_B forwards UPDATE to UE_B
106 A								→			User B is informed that the media stream has been removed

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
107 A							←			200 OK	UE_B responds to INVITE with 200 OK
108 A						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
109 A					←					200 OK	**IBCF_B forwards 200 OK response to IBCF_A**
110 A			←							**200 OK**	**IBCF_A forwards 200 OK response to IMS_A**
111 A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
112 A	←										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 4)
	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	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using 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 8 (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 }* *}*
	2	TP_IMS_5137_01 in CFW step 8 (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 8 (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 30 (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) }* *}*

Interoperability Test Description		
	5	TP_IMS_5408_03 in CFW step 37A (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 9 (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 17 (180 Ringing): *ensure that {* *when { UE_B sends a 180_response to UE_A }* *then { IMS_B sends the 180_response to IMS_A* *containing a Via_header* *indicating the IBCF_SIP_URI of IMS_A and* *containing (encrypted_consecutive_header_entries and* *a tokenized-by_parameter) }* *}*
	8	TP_IMS_5137_03 in CFW step 24 and 43A (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**	**ENUMDB**	**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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6				→	→					**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7				←						100 Trying	IBCF_A responds with a 100 Trying provisional response
8						→				INVITE	IBCF_A forwards INVITE to IBCF_B
9						←				100 Trying	IBCF_B responds with a 100 Trying provisional response

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12							→			INVITE	IMS_B forwards INVITE to UE_B
13							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
14								→			User B is informed of incoming call of User A
15							←			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16						←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IBCF_B**
17					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
18			←							180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
19		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20	←										User A is informed that UE_B is ringing
21								←			User B answers call
22							←			200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
23						←				200 OK	**IMS_B forwards 200 OK response to IBCF_B**
24					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
25			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
26		←								**200 OK**	**IMS_A forwards 200 OK response to UE_A**
27	←										User A is informed that call has been answered
28		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
29			→	→						**ACK**	**IMS_A forwards ACK to IBCF_A**
30					→					ACK	IBCF_A forwards ACK to IBCF_B
31						→				ACK	IBCF_B forwards ACK to IMS_B
32							→			ACK	IMS_B forwards ACK to UE_B
33								→			User B is informed that the call is established
34A	→										User A ends call
35A		→								BYE	UE_A releases the call with BYE
36A			→	→						**BYE**	**IMS_A forwards BYE to IBCF_A**
37A					→					BYE	IBCF_A forwards BYE to IBCF_B

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
38A						→				BYE	IBCF_B forwards BYE to IMS_B
39A							→			BYE	IMS_B forwards BYE to UE_B
40A								→			User B is informed that call has ended
41A							←			200 OK	UE_B sends 200 OK for BYE
42A						←				200 OK	IMS_B forwards 200 OK response to IBCF_B
43A					←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
44A			←							200 OK	IBCF_A forwards 200 OK response to IMS_A
45A		←								200 OK	IMS_A forwards the 200 OK response to UE_A
46A	←										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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5408_02 in CFW step 26 (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	ENUM DB	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			→							ENUM	IMS_A sends query to ENUM DB
5			←							ENUM	ENUM DB sends response to IMS_A
6			→	→						**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7			←	←						100 Trying	IBCF_A responds with a 100 Trying provisional response
8					→					INVITE	IBCF_A forwards INVITE to IBCF_B
9					←					100 Trying	IBCF_B responds with a 100 Trying provisional response
10						→				INVITE	IBCF_B forwards INVITE to IMS_B
11						←				100 Trying	IMS_B responds with a 100 Trying provisional response
12							→			INVITE	IMS_B forwards INVITE to UE_B
13							←			100 Trying	UE_B optionally responds with a 100 Trying provisional response
14								→			User B is informed of incoming call of User A
15							←			180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
16						←				**180 Ringing**	**IMS_B forwards 180 Ringing response to IBCF_B**
17					←					180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
18			←	←						180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
		←								180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
20	←										User A is informed that UE_B is ringing

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
21											User A cancels the Call
22		→								CANCEL	UE_A sends a CANCEL to IMS_A
23		←								200 OK	IMS_A responds with a 200 OK to UE_A
24			→	→						**CANCEL**	**IMS_A forwards the CANCEL to IBCF_A**
25			←	←						200 OK	IBCF_A responds with a 200 OK to IMS_A
26					→	→				CANCEL	IBCF_A forwards the CANCEL to IBCF_B
27					←	←				200 OK	IBCF_B responds with a 200 OK to IBCF_A
28						→	→			CANCEL	IBCF_B forwards the CANCEL to IMS_B
29						←	←			200 OK	IMS_B responds with a 200 OK to IBCF_B
30							→	→		CANCEL	IMS_B forwards the CANCEL to UE_B
31							←	←		200 OK	UE_B responds with a 200 OK to IMS_B
32								→	→		User B is informed that call has been cancelled
33							←	←		487 Request Terminated	UE_B sends 487 Request Terminated to IMS_B
34							→	→		ACK	IMS_B responds with ACK to UE_B
35						←	←			487 Request Terminated	IMS_B forwards the 487 Request Terminated to IBCF_B
36						→	→			ACK	IBCF_B responds with ACK to IMS_B
37					←	←				487 Request Terminated	IBCF_B forwards the 487 Request Terminated to IBCF_A
38					→	→				ACK	IBCF_A responds with ACK to IBCF_B
39			←	←						487 Request Terminated	IBCF_A forwards the 487 Request Terminated to IMS_A
40			→	→						ACK	IMS_A responds with ACK to IBCF_A
41		←	←							487 Request Terminated	IMS_A forwards the 487 Request Terminated to UE_A
42		→	→							ACK	UE_A responds with ACK to IMS_A
43	←	←									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
Conformance Criteria:	**Check**	
	1	TP_IMS_5408_04 in CFW step 54A and 89A (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	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User B		
48								→			User B is presented that call is in progress
49A	→										User A puts call on hold
50A		→								INVITE	UE_A sends reINVITE message indicating media attribute "sendonly" (Call Hold)
51A		←								100 Trying	IMS_A responds with a 100 Trying provisional response
52A			→		→					INVITE	IMS_A forwards INVITE to IBCF_A
53A			←		←					100 Trying	IBCF_A responds with a 100 Trying provisional response
54A						→				INVITE	IBCF_A forwards INVITE to IBCF_B
55A						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
56A							→			INVITE	IBCF_B forwards INVITE to IMS_B
57A							←			100 Trying	IMS_B responds with a 100 Trying provisional response
58A							←			INVITE	IMS_B forwards INVITE to IBCF_B
59A							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
60A						←				INVITE	IBCF_B forwards INVITE to IBCF_A
61A						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
62A			←		←					INVITE	IBCF_A forwards INVITE to IMS_A
63A			→		→					100 Trying	IMS_A responds with a 100 Trying provisional response
64A			→		→	→	→	→		INVITE	IMS_A 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 on hold
67A			←		←	←	←	←		200 OK	UE_B responds to INVITE with 200 OK indicating attribute "recvonly" inactive
68A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A
69A						→				200 OK	IBCF_A forwards 200 OK response to IBCF_B
70A							→			200 OK	IBCF_B forwards 200 OK response to IMS_B
71A							←			200 OK	IMS_B forwards 200 OK response to IBCF_B
72A						←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
73A			←		←					200 OK	IBCF_A forwards 200 OK response to IMS_A
74A		←								200 OK	IMS_A forwards 200 OK response to UE_A
75A		→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE

Step	Direction									Message	Comment
	User A	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
76A			→		→					ACK	IMS_A forwards ACK to IBCF_A
77A						→				ACK	IBCF_A forwards ACK to IBCF_B
78A							→			ACK	IBCF_B forwards ACK to IMS_B
79A							←			ACK	IMS_B forwards ACK to IBCF_B
80A						←				ACK	IBCF_B forwards ACK to IBCF_A
81A			←		←					ACK	IBCF_A forwards ACK to IMS_A
82A			→		→	→	→	→		ACK	IMS_A forwards ACK to UE_B
83A	←	←									User A is informed that call is on hold
84A	→	→									User A resumes call
85A		→	→							INVITE	UE_A sends reINVITE message indicating media attribute "sendrecv" (Call Resume)
86A		←	←							100 Trying	IMS_A responds with a 100 Trying provisional response
87A			→		→					INVITE	IMS_A forwards INVITE to IBCF_A
88A			←		←					100 Trying	IBCF_A responds with a 100 Trying provisional response
89A						→				INVITE	IBCF_A forwards INVITE to IBCF_B
90A						←				100 Trying	IBCF_B responds with a 100 Trying provisional response
91A							→			INVITE	IBCF_B forwards INVITE to IMS_B
92A							←			100 Trying	IMS_B responds with a 100 Trying provisional response
93A							←			INVITE	IMS_B forwards INVITE to IBCF_B
94A							→			100 Trying	IBCF_B responds with a 100 Trying provisional response
95A						←				INVITE	IBCF_B forwards INVITE to IBCF_A
96A						→				100 Trying	IBCF_A responds with a 100 Trying provisional response
97A			←		←					INVITE	IBCF_A forwards INVITE to IMS_A
98A			→		→					100 Trying	IMS_A responds with a 100 Trying provisional response
99A			→		→	→	→	→		INVITE	IMS_A forwards INVITE to UE_B
100A			←		←	←	←	←		100 Trying	UE_B optionally responds with a 100 Trying provisional response
101A								→			User B is informed that call is resumed
102A			←		←	←	←			200 OK	UE_B responds to INVITE with 200 OK indicating media attribute "sendrecv"
103A			→		→					200 OK	IMS_A forwards 200 OK response to IBCF_A

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

4.5.4 Messaging

4.5.4.1 Messaging with 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_ENUM_01	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 10 in 1st numbered list)
	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 ¶100 (item 1 in 4th 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 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 [15] see Table 6.1 and Table 6.3)	

Interoperability Test Description		
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_ENUM_01 in CFW step 4 (NAPTR Response): *ensure that {* *when { UE_A sends an initial INVITE for UE_B to IMS_A* *containing a Request_URI* *indicating a Tel_URI* *and IMS_A sends a NAPTR_Query to ENUM_DB* *containing the TN derived_from the Tel_URI_E.164_Number* *}* *then { ENUM_DB sends a NAPTR_Response to IMS_A* *containing a NAPTR_Resource_Record* *containing the TTL of the NAPTR_record* *containing the service_type* *indicating E2U+sip* *containing the_regular_expression* *indicating !^(.*)$!* *containing the SIP_URI of UE_B* *indicating backreference (\1) for the user part* *indicating domain name for the host part* *containing SIP_URI_parameters 'if applicable' }*
	2	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 NAPTR_Query to ENUM DB* *containing the Tel_URI_E.164_Number }* *when { IMS_A receives NAPTR_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 }* *}*
	3	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	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response 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

4.5.4.2 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 (1st numbered list)
	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 4th numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 5th numbered list)
Use Case ref.:	UC_05_I	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using 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 [15] 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_5097_05 in CFW step 6 (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 6 (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 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-Charging-Vector_header* *not containing an access-network-charging-info_parameter }* *}*
	4	TP_IMS_5118_01 in CFW step 12 (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	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response 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**
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

4.5.4.3 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 4th numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 5th numbered list)
	TP_IMS_5117_06	TS 124 229 [1], clause 5.4.3.3 ¶100 (item 1 in 4th 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 [15] see Tables 6.1 and 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 6 (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 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-Charging-Vector_header* *not containing a access-network-charging-info_parameter }* *}*
	3	TP_IMS_5118_01 in CFW step 12 (200 OK) *ensure that {* *when { UE_B sends 200_response to UE_A }* *then { IMS_A receives the 200_response* *containing a P-Charging-Vector_header* *containing a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *containing a term-ioi_parameter* *indicating operator_identifier of IMS_B }* *}*
	4	TP_IMS_5117_06 in CFW step 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	UEA	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	UEB	User B		
1	→										User A sends an instant message to user B
2		→								MESSAGE	UE_A sends MESSAGE to IMS_A
3			→							ENUM	IMS_A sends query to ENUM DB
4			←							ENUM	ENUM DB sends response 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**
8							→			MESSAGE	IMS_B sends MESSAGE to UE_B

Step	Direction									Message	Comment
	User A	UE A	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	UE B	User 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 (items 6 and 7 in 1st numbered list)
	TP_IMS_5118_01	TS 124 229 [1], clause 5.4.3.3 ¶105 (item 2 in 5th 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 [15] 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

Interoperability Test Description		
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 18 (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** | **ENUM DB** | **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	←	ENUM	IMS_A sends query to ENUM DB
7	→	ENUM	ENUM DB sends response to IMS_A
8	←	MESSAGE	IMS_B sends MESSAGE to IBCF_B
9	←	MESSAGE	IBCF_B sends MESSAGE to IBCF_A
10	←	MESSAGE	IBCF_A sends MESSAGE to IMS_A
11	←	MESSAGE	IMS_A sends MESSAGE to UE_A
12	←		User A is informed about the instant message
13	→	200 OK	UE_A sends 200 OK to IMS_A
14	→	200 OK	**IMS_A sends 200 OK to IBCF_A**
15	→	200 OK	**IBCF_A sends 200 OK to IBCF_B**

Step	Direction									Message	Comment
	User A	UEA	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	UEB	User B		
16										**200 OK**	**IBCF_B sends 200 OK to IMS_B**
17										200 OK	IMS_B sends 200 OK to IBCF_B
18										200 OK	IBCF_B sends 200 OK to IBCF_A
19										200 OK	IBCF_A sends 200 OK to IMS_A
20										200 OK	IMS_A sends 200 OK to UE_B
21											Optional: User B 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 2nd 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 [15] 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 12 (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	ENUM DB	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				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response to IMS_A
5					→					**MESSAGE**	**IMS_A sends MESSAGE to IBCF_A**
7						→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
9							→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
10											IMS_B detects that user B is not registered
11							←			4xx Response	**IMS_B sends 4xx Response to IBCF_B**
12						←				4xx Response	**IBCF_B forwards 4xx Response to IBCF_A**
13					←					4xx Response	**IBCF_A forwards 4xx Response to IMS_A**
14			←							4xx Response	IMS_A forwards 4xx Response to UE_A
15		←									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 [15] 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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_06 in CFW step 12 (404 Response) *ensure that {* *when { UE_A sends a MESSAGE to UE_B and* *IMS_A sends the MESSAGE to IMS_B* *containing a Request_URI* *indicating a barred_user in IMS_B }* *then { IMS_B sends 404_response to IMS_A }* *}*

Step	Direction									Message	Comment
	User A	**UEA**	**IMSA**	**ENUMDB**	**IBCFA**	**IBCFB**	**IMSB**	**UEB**	**User B**		
1		→									User A sends an instant message to user B
2			→							MESSAGE	UE_A sends MESSAGE to IMS_A
3				→						ENUM	IMS_A sends query to ENUM DB
4				←						ENUM	ENUM DB sends response to IMS_A
5					→					**MESSAGE**	**IMS_A sends MESSAGE to IBCF_A**
7						→				MESSAGE	IBCF_A sends MESSAGE to IBCF_B
9							→			MESSAGE	IBCF_B sends MESSAGE to IMS_B
10											IMS_B detects that user B is not registered
11						←				404 Not Found	**IMS_B sends 404 Response to IBCF_B**
12					←					404 Not Found	**IBCF_B forwards 404 Response to IBCF_A**
13				←						404 Not Found	**IBCF_A forwards 404 Response to IMS_A**
14			←							404 Not Found	IMS_A forwards 404 Response to UE_A
15		←									Optional: User A is presented a delivery report

4.5.5 Supplementary Services

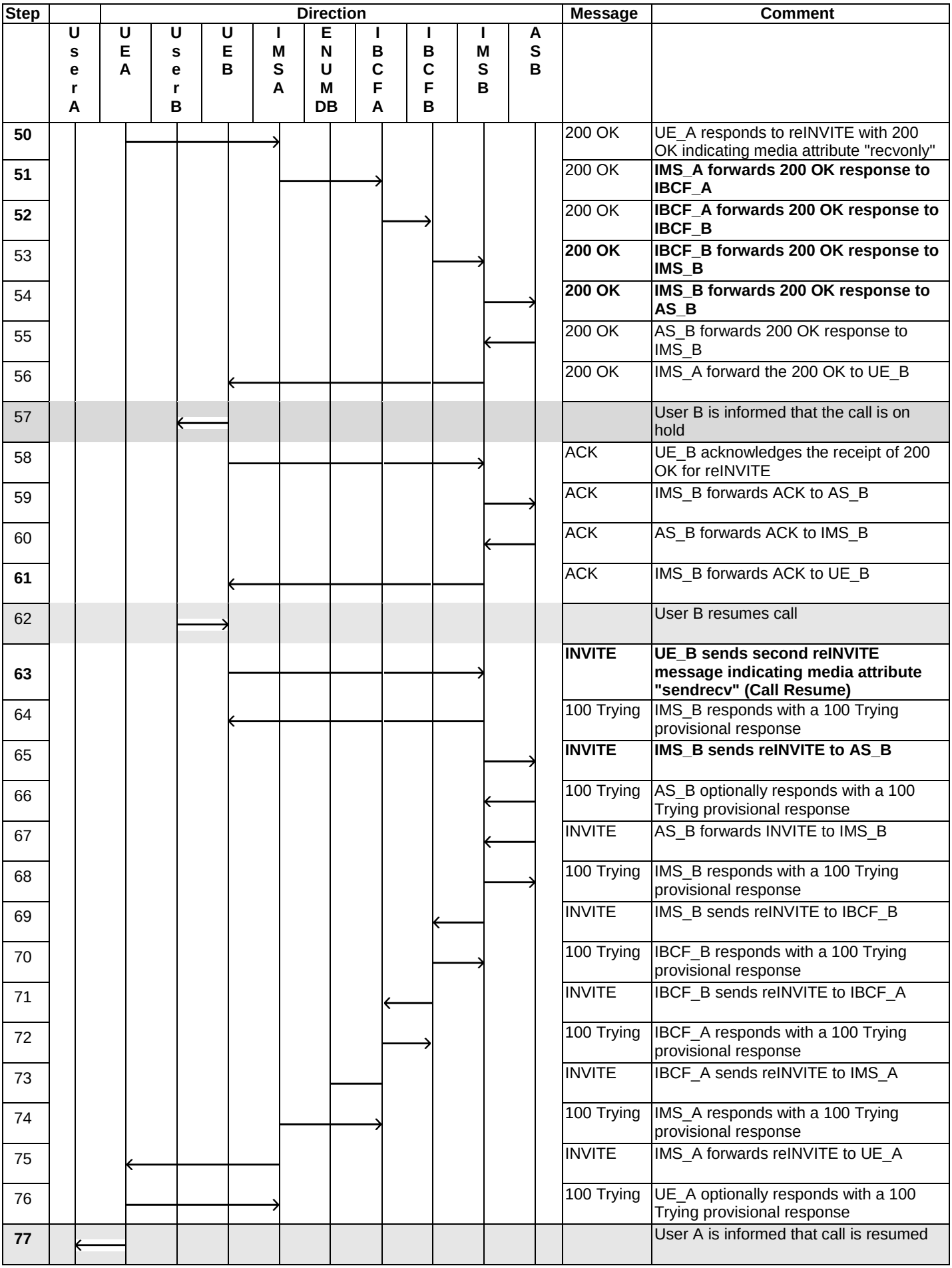
4.5.5.1 Supplementary Service HOLD with AS

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	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using userHOLD identity according to table 1 • IMS_B is configured to contact AS_B (HOLD) • UE_B is subscribed to HOLD service • AS B in same trust domain as IMS B	
Test Sequence:	**Step**	
	1	User A calls User B (i.e. userHOLD in IMS_B)
	2	Verify that user B is informed of incoming call of User A
	3	Verify that user A is informed that UE_B is ringing
	4	User B answers call
	5	Verify that user A is informed that call has been answered
	6	Verify that user B is informed that call is established
	7	User B puts call on hold
	8	Verify that user A is informed that call on hold with AS tone
	9	Verify that user B is informed that call on hold
	10	User B resumes call
	11	Verify that user A is informed that call is resumed
	12	Verify that user B is informed that call is resumed
	13	User A ends call
	14	Verify that user B is informed that call has ended
	15	Verify that user A is informed that call has ended
Conformance Criteria:	**Check**	
	1	TP_IMS_5310_01 in CFW step 37 (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 52 and Step 54 (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 65 (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 80 and Step 82 (200 OK) *ensure that {* *when { IMS_B receives a 200_response from IMS_A* *containing a P-Charging-Vector_header* *containing an access-network-charging-info_parameter* *}* *then { IMS_B sends the 200_response to AS_B* *containing a P-Charging-Vector_header* *containing a access-network-charging-info_parameter* *}* *}*

Step		Direction									Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
34			→									User B puts call on hold
35				→				→			**INVITE**	**UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)**
36				←				←			100 Trying	IMS_B responds with a 100 Trying provisional response
37									→		**INVITE**	**IMS_B sends reINVITE to AS_B**
38									←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
39									←		INVITE	AS_B sends reINVITE to IMS_B
40									→		100 Trying	IMS_B responds with a 100 Trying provisional response
41								←			INVITE	IMS_B forwards reINVITE to IBCF_B
42								→			100 Trying	IBCF_B responds with a 100 Trying provisional response
43							←				INVITE	IBCF_B forwards reINVITE to IBCF_A
44							→				100 Trying	IBCF_A responds with a 100 Trying provisional response
45					←						INVITE	IBCF_A forwards reINVITE to IMS_A
46					→						100 Trying	IMS_A responds with a 100 Trying provisional response
47		←									INVITE	IMS_A forwards reINVITE to UE_A
48		→									100 Trying	UE _A optionally responds with a 100 Trying provisional response
49	←											User A is informed that call is on hold with AS tone



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

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
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

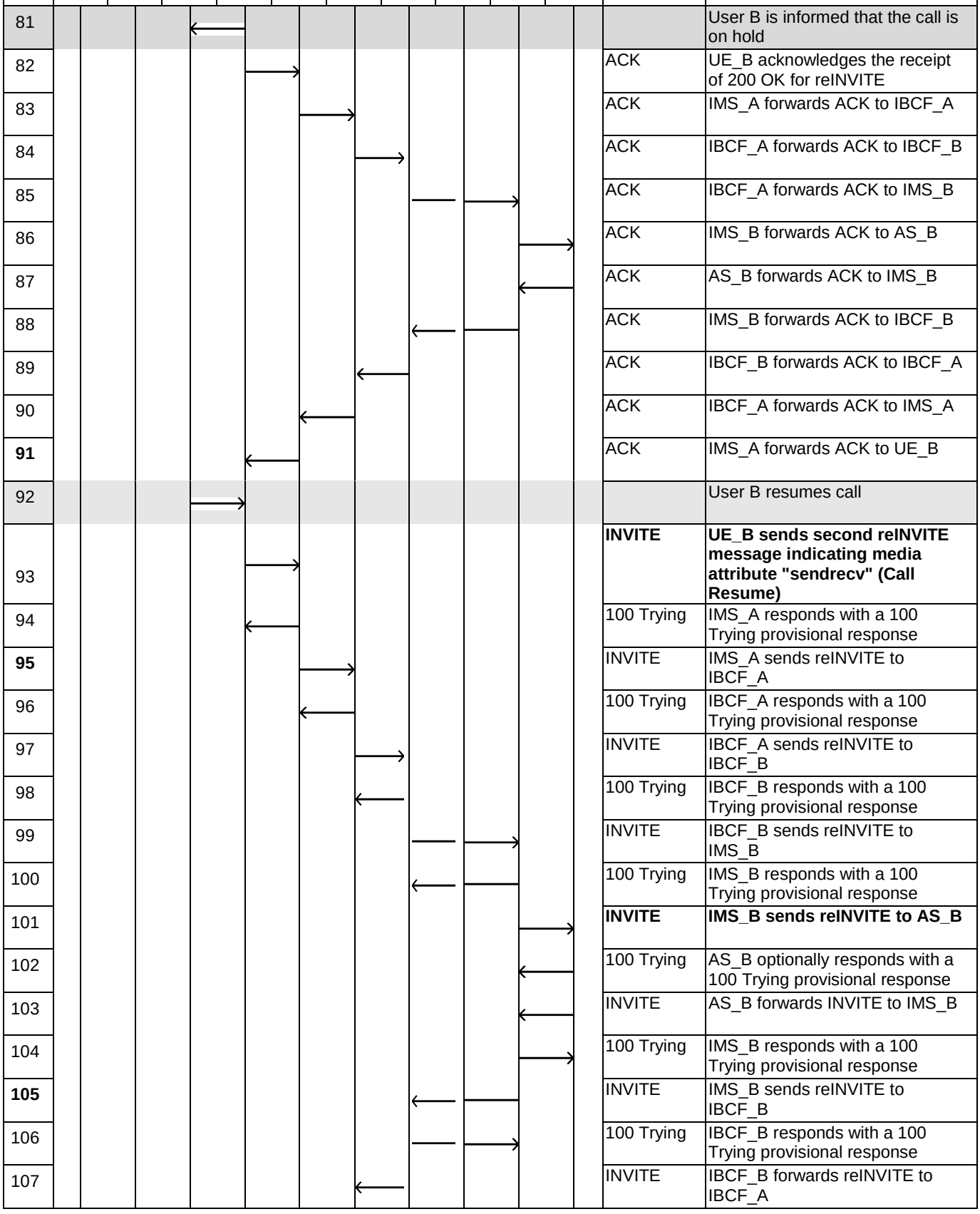
4.5.5.2 Supplementary Service HOLD with AS in roaming

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 54 and Step 58 (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 73 and Step 75 (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 101 (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 112 and Step 114 (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	ENUMDB	IMSB	ASB		
49			→									User B puts call on hold
50				→							**INVITE**	**UE_B sends reINVITE message indicating media attribute "sendonly" (Call Hold)**
51				←							100 Trying	IMS_A responds with a 100 Trying provisional response
52					→						INVITE	IMS_A forwards INVITE to IBCF_A
53					←						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	ENUM DB	IMS B	AS B		
54						→					INVITE	IBCF_A forwards INVITE to IBCF_B
55						←					100 Trying	**IBCF_B responds with a 100 Trying provisional response**
56							→	→			INVITE	IBCF_B forwards INVITE to IMS_B
57							←				100 Trying	IMS_B responds with a 100 Trying provisional response
58									→		**INVITE**	**IMS_B sends reINVITE to AS_B**
59									←		100 Trying	AS_B optionally responds with a 100 Trying provisional response
60									←		INVITE	AS_B sends reINVITE to IMS_B
61									→		100 Trying	IMS_B responds with a 100 Trying provisional response
62							←				INVITE	IMS_B forwards reINVITE to IBCF_B
63								→			100 Trying	IBCF_B responds with a 100 Trying provisional response
64						←					INVITE	IBCF_B forwards reINVITE to IBCF_A
65						→					100 Trying	IBCF_A responds with a 100 Trying provisional response
66					←						INVITE	IBCF_A forwards reINVITE to IMS_A
67					→						100 Trying	IMS_A responds with a 100 Trying provisional response
68		←		←							INVITE	IMS_A forwards reINVITE to UE_A
69		→		→							100 Trying	UE _A optionally responds with a 100 Trying provisional response
70	←											User A is informed that call is on hold with AS tone
71		→		→							200 OK	UE_A responds to reINVITE with 200 OK indicating media attribute "recvonly"
72					→						200 OK	**IMS_A forwards 200 OK response to IBCF_A**
73						→					200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
74							→	→			**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
75									→		**200 OK**	**IMS_B forwards 200 OK response to AS_B**
76									←		200 OK	AS_B forwards 200 OK response to IMS_B
77							←				200 OK	IMS_B forwards 200 OK response to IBCF_B
78						←					200 OK	IBCF_B forwards 200 OK response to IBCF_A
79					←						200 OK	IBCF_A forwards 200 OK response to IMS_A
80				←							200 OK	IMS_A forward the 200 OK to UE_B



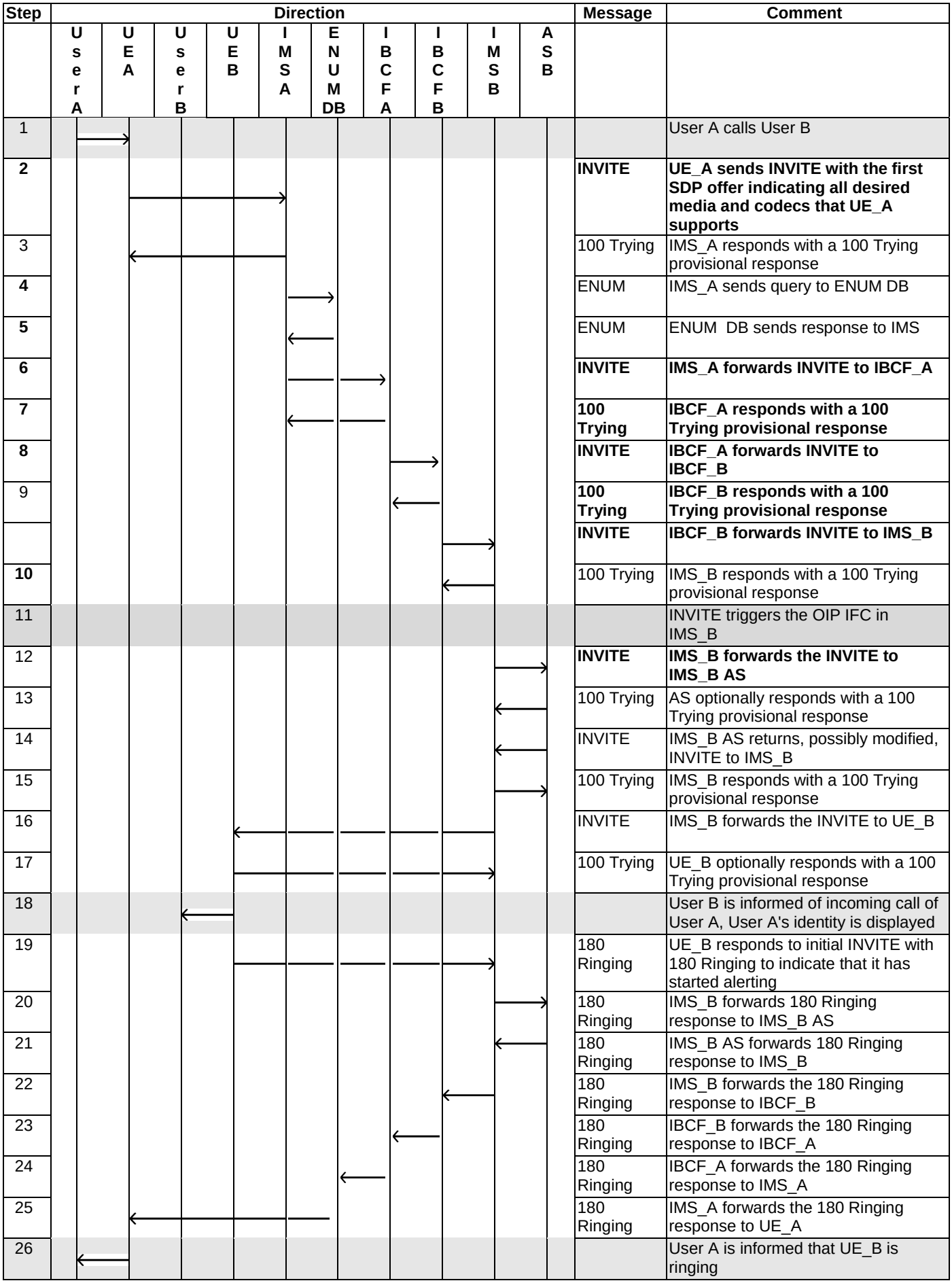
Step	Direction										Message	Comment
	User A	UE A	User B	UE B	IMS A	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
81			←									User B is informed that the call is on hold
82				→							ACK	UE_B acknowledges the receipt of 200 OK for reINVITE
83					→						ACK	IMS_A forwards ACK to IBCF_A
84						→					ACK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

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
108											100 Trying	IBCF_A responds with a 100 Trying provisional response
109											INVITE	IBCF_A forwards reINVITE to IMS_A
110											100 Trying	IMS_A responds with a 100 Trying provisional response
107											INVITE	IMS_A forwards reINVITE to UE_A
108											100 Trying	UE_A optionally responds with a 100 Trying provisional response
109												User A is informed that call is resumed
110											200 OK	UE_A sends the 200 OK indicating media attribute "sendrecv" to IMS_A
111											200 OK	**IMS_A forwards 200 OK response to IBCF_A**
112											200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
113											**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
114											**200 OK**	**IMS_B forwards 200 OK response to AS_B**
115											200 OK	AS_B forwards the 200 OK for INVITE
116											200 OK	IMS_B forwards 200 OK to IBCF_B
117											200 OK	IBCF_B forwards 200 OK to IBCF_A
118											200 OK	IBCF_A forwards 200 OK to IMS_A
119											200 OK	IMS_A forwards 200 OK to UE_B
120												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 (3rd numbered list)
Use Case ref.:	UC_08_I	

Interoperability Test Description		
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • UE_B is registered in IMS_B using 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
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_02 in CFW step 8 (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 12 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter) }* *}*
	3	TP_IMS_5115_08 in CFW step 32 (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	ENUM DB	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											ENUM	IMS_A sends query to ENUM DB
5											ENUM	ENUM DB sends response to IMS
6											**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7											**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
8											**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
9											**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
											INVITE	**IBCF_B forwards INVITE to IMS_B**
10											100 Trying	IMS_B responds with a 100 Trying provisional response
11												INVITE triggers the OIP IFC in IMS_B
12											**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13											100 Trying	AS optionally responds with a 100 Trying provisional response
14											INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
15											100 Trying	IMS_B responds with a 100 Trying provisional response
16											INVITE	IMS_B forwards the 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, User A's identity is displayed
19											180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
20											180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
21											180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
22											180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
23											180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
24											180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
25											180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
26												User A is informed that UE_B is ringing

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
27			→									User B answers call
28				→					→		200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
29									→		200 OK	IMS_B forwards 200 OK response to IMS_B AS
30									←		**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
31								←			**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
32							←				200 OK	IBCF_B forwards the 200 OK response to IBCF_A
33					←						200 OK	IBCF_A forwards the 200 OK response to IMS_A
34		←									200 OK	IMS_A forwards the 200 OK response to UE_A
35	←											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 (3rd 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 8 (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 12 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter) }* *}*
	3	TP_IMS_5115_08 in CFW step 39 (200 OK) *ensure that {* *when { IMS_B receives 200_response from AS_B addressed_to UE_A }* *then { IMS_B sends the 200_response to IMS_A* *containing a P-Charging-Vector_header* *including a orig-ioi_parameter* *indicating operator_identifier of IMS_A and* *including a term-ioi_parameter* *indicating operator_identifier of IUT_ }* *}*

Step	**Direction**	**Message**	**Comment**
	User A **UE A** **User B** **UE B** **IMS A** **ENUM DB** **IBCF A** **IBCF B** **IMS B** **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		ENUM	IMS_A sends query to ENUM DB
5		ENUM	ENUM DB sends response to IMS_A
6		**INVITE**	**IMS_A forwards INVITE to IBCF_A**
7		**100 Trying**	**IBCF_A responds with a 100 Trying provisional response**
8		**INVITE**	**IBCF_A forwards INVITE to IBCF_B**
9		**100 Trying**	**IBCF_B responds with a 100 Trying provisional response**
		INVITE	**IBCF_B forwards INVITE to IMS_B**

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
10					←			←			100 Trying	IMS_B responds with a 100 Trying provisional response
11												INVITE triggers the OIP IFC in IMS_B
12									→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13									←		100 Trying	AS optionally responds with a 100 Trying provisional response
14									←		INVITE	IMS_B AS returns, possibly modified, INVITE to IMS_B
15									→		100 Trying	IMS_B responds with a 100 Trying provisional response
16								←			INVITE	IMS_B forwards the INVITE to IBCF_B
17								→			100 Trying	IBCF_B 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	IBCF_A forwards INVITE to IMS_A
21					→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
22				←							INVITE	IMS_A forwards the INVITE to UE_B
23				→							100 Trying	UE_B optionally responds with a 100 Trying provisional response
24			←									User B is informed of incoming call of User A, User A's identity is displayed
25				→							180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
26					→	→					180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
27							→				180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
28								→			180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
29									→		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS
30									←		180 Ringing	IMS_B AS forwards 180 Ringing response to IMS_B
31								←			180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
32							←				180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
33					←	←					180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
34		←									180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
35	←											User A is informed that UE_B is ringing
36			→									User B answers call
37				→							200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered

Step	Direction										Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	IBCFA	IBCFB	IMSB	ASB		
38											200 OK	IMS_A forwards 200 OK response to IBCF_A
39											200 OK	IBCF_A forwards 200 OK response to IBCF_B
40											200 OK	IBCF_B forwards 200 OK response to IMS_B
41											200 OK	IMS_B forwards 200 OK response to IMS_B AS
42											**200 OK**	**IMS_B AS forwards 200 OK response to IMS_B**
43											**200 OK**	**IMS_B forwards the 200 OK response to IBCF_B**
44											200 OK	IBCF_B forwards the 180 Ringing response to IBCF_A
45											200 OK	IBCF_A forwards the 180 Ringing response to IMS_A
46											200 OK	IMS_A forwards the 200 OK response to UE_A
47												User A is informed that call has 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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5108_03 in CFW step 16 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter) }* *}*
	2	TP_IMS_5313_01 in CFW step 22 (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	ENUM DB	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 codecs that UE_A supports
3		←		←	←							100 Trying	IMS_A responds with a 100 Trying provisional response
4					→							ENUM	IMS_A sends query to ENUM DB
5					←							ENUM	ENUM DB sends response to IMS_A
													INVITE triggers the OIR IFC in IMS_A
6					→	→	→					INVITE	IMS_A forwards the INVITE to IMS_A AS
7					←		←					100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
8					←		←					INVITE	IMS_A AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_A
9					→	→	→					100 Trying	IMS_A responds with a 100 Trying provisional response
10					→		→	→				**INVITE**	**IMS_A forwards INVITE to IBCF_A**
11					←			←				100 Trying	IBCF_A responds with a 100 Trying provisional response
12								→				INVITE	**IBCF_A forwards INVITE to IBCF_B**

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUM DB	ASA	IBCF A	IBCF B	IMS B	AS B		
13								←				100 Trying	IBCF_B responds with a 100 Trying provisional response
14									→	→		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
15									←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
													INVITE triggers the ACR IFC in IMS_B
16										→	→	**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
17										←	←	100 Trying	AS optionally responds with a 100 Trying provisional response
18										←	←	433 Anonymity Disallowed	IMS_B AS responds with 433 Anonymity Disallowed to IMS_B
19									←	←		**433 Anonymity Disallowed**	**IMS_B forwards the 433 Anonymity Disallowed to IBCF_B**
20								←	←			433 Anonymity Disallowed	**IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A**
21					←	—	—	—				433 Anonymity Disallowed	**IBCF_A forwards the 433 Anonymity Disallowed to IMS_A**
22					→	→	—					**433 Anonymity Disallowed**	**IMS_A forwards the 433 Anonymity Disallowed to IMS_A AS**
23					←	—	—					433 Anonymity Disallowed	IMS_A AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_A
24		←	—	—	—							433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_A
25	←												User A is informed that the call has been rejected due to ACR
26		→	—	—	→							ACK	UE_A sends ACK to IMS_A
27					→	→	—					ACK	IMS_A forwards the ACK to IMS_A AS
28					←	—	—					ACK	IMS_A AS forwards, possibly modified, ACK to IMS_A
29					→	→	→					ACK	IMS_A forwards ACK to IBCF_A
30								→				ACK	IBCF_A forwards ACK to IBCF_B
31									→	→		ACK	IBCF_B forwards ACK to IMS_B
32										→	→	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 12 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_A }* *then { IUT sends the initial INVITE to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header and* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter and* *containing an access-network-charging-info_parameter) }* *}*

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
1			→										User B calls User A
2				→								**INVITE**	**UE_B sends INVITE with the first SDP offer indicating all desired media and codecs that UE_B supports**
3				←								100 Trying	IMS_A responds with a 100 Trying provisional response
4					→							**INVITE**	**IMS_A sends INVITE to IBCF_A**
5					←							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	ASA	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
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
10									←			ENUM	IMS B sends query to ENUM DB
11									→			ENUM	ENUM DB sends response to IMS B
													INVITE triggers the OIR IFC in IMS_B
12										→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
13										←		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
14										←		INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
15										→		100 Trying	IMS_B responds with a 100 Trying provisional response
16								←	←			INVITE	IMS_B forwards INVITE to IBCF_B
17								→	→			100 Trying	IBCF_B 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	IBCF_A forwards INVITE to IMS_A
21					→	→						100 Trying	IMS_A responds with a 100 Trying provisional response
													INVITE triggers the ACR IFC in IMS_A
22					→							INVITE	IMS_A forwards the INVITE to IMS_A AS
23					←							100 Trying	AS optionally responds with a 100 Trying provisional response
24					←							433 Anonymity	IMS_A AS responds with 433 Anonymity Disallowed to IMS_A
25					→	→						433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to IBCF_A
26							→					433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IBCF_B
27								→	→			433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IMS_B
28										→		433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IMS_B
29										←		433 Anonymity Disallowed	IMS_B AS forwards, possibly modified, 433 Anonymity Disallowed to IMS_B
30								←	←			433 Anonymity	IMS_B forwards the 433 Anonymity Disallowed to IBCF_B

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
31					←		←					433 Anonymity	IBCF_B forwards the 433 Anonymity Disallowed to IBCF_A
32					←	←						433 Anonymity	IBCF_A forwards the 433 Anonymity Disallowed to IMS_A
33				←	←							433 Anonymity	IMS_A forwards the 433 Anonymity Disallowed to UE_B
34			←	←									User B is informed that the call has been rejected due to ACR
35				→	→							ACK	UE_B sends ACK to IMS_A
36					→	→						ACK	IMS_A sends ACK to IBCF_A
37							→					ACK	IBCF_A sends ACK to IBCF_B
38								→	→			ACK	IBCF_B sends ACK to IMS_B
39										→	→	ACK	IMS_B forwards the ACK to IMS_B AS
40										←	←	ACK	IMS_B AS forwards, possibly modified, ACK to IMS_B
41								←	—			ACK	IMS_B forwards ACK to IBCF_B
42							←					ACK	IBCF_B forwards ACK to IBCF_A
43					←	←						ACK	IBCF_A forwards ACK to IMS_A
44					→	→						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 (3rd 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 8 (INVITE): *ensure that {* *when { UE_A sends an initial INVITE to UE_B }* *then { IMS_B receives the initial INVITE* *not containing a Route_header* *indicating the S-CSCF_SIP_URI of IMS_A* *containing a P-Charging-Vector_header* *(containing an icid-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 12 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing 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_BIUT_ }* *}*

Step	**Direction**										**Message**	**Comment**
	User A	**UEA**	**User B2**	**UE B2**	**IMS A**	**ENUM DB**	**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						→					ENUM	IMS_A sends query to ENUM DB

Step	Direction										Message	Comment
	User A	UE A	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	AS B		
5					←						ENUM	ENUM DB sends response to IMS_A
6					→	→					INVITE	**IMS_A forwards INVITE to IBCF_A**
7					←	←					100 Trying	**IBCF_A responds with a 100 Trying provisional response**
8							→	→			INVITE	**IBCF_A forwards INVITE to IBCF_B**
9							←	←			100 Trying	**IBCF_B responds with a 100 Trying provisional response**
10								→	→		**INVITE**	**IBCF_B forwards INVITE to IMS_B**
11								←	←		100 Trying	IMS_B responds with a 100 Trying provisional response
												INVITE triggers the CFU IFC in IMS_B
12									→	→	**INVITE**	**IMS_B forwards the INVITE to AS_B**
13									←	←	100 Trying	AS_B optionally responds with the 100 Trying to IMS_B
												AS_B applies the CDIV CFU procedure
14									←	←	181 Call is being forwarded	AS_B indicates optionally to IMS_B that call has been forwarded
15								←	←		181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
16							←	←			181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
17					←	←	←				181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
18		←	←	←	←						181 Call is being	IMS_A indicates that call to UE_B has been forwarded
19	←	←										User A may be informed of call diversion
20									←	←	INVITE	AS_B returns modified INVITE including new request URI and history header to IMS_B
21									→	→	100 Trying	IMS_B responds with a 100 Trying provisional response
22				←	←	←	←	←			INVITE	IMS_B forwards the INVITE to UE_B2
23				→	→	→	→	→			100 Trying	UE_B2 optionally responds with a 100 Trying provisional response
24			←	←								User B2 is informed of incoming call of User A
25			→	→								User B2 answers call
26				→	→	→	→	→			200 OK	UE_B2 responds to INVITE with 200 OK to indicate that the call has been answered
27									→	→	200 OK	IMS_B forwards 200 OK response to AS_B
28									←	←	200 OK	AS_B returns, possibly modified, 200 OK to IMS_B
29								←	←		200 OK	IMS_B forwards 200 OK response to IBCF_B

Step	Direction										Message	Comment
	User A	UEA	User B2	UE B2	IMS A	ENUM DB	IBCF A	IBCF B	IMS B	ASB		
30							←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
31						←					200 OK	IBCF_A forwards 200 OK response to IMS_A
32			←								200 OK	IMS_A forwards 200 OK response to UE_A
33	←											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 1st numbered 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 15 (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 39 (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 / ENUM DB / IMS B / AS A		
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	IMS A → UE B	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	IBCF A → IMS 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**

Step	Direction										Message	Comment
	User A2	UE A2	User B	UE B	IMS A	IBCF A	IBCF B	ENUM DB	IMS B	AS A		
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								←	←		ENUM	IMS_A sends query to ENUM DB
11								→	→		ENUM	ENUM DB sends response to IMS_A
12							←		←		**INVITE**	**IMS_B forwards INVITE to IBCF_B**
13							→		→		100 Trying	IBCF_B responds with a 100 Trying provisional response
14						←					**INVITE**	**IBCF_B forwards INVITE to IBCF_A**
15						→					100 Trying	IBCF_A responds with a 100 Trying provisional response
16					←						**INVITE**	**IBCF_A forwards INVITE to IMS_A**
17					→						100 Trying	IMS_A responds with a 100 Trying provisional response
												INVITE triggers the CFU IFC in IMS_A
18					→	→	→		→	→	INVITE	IMS_A forwards the INVITE to IMS_A AS
19					←	←	←		←	←	100 Trying	IMS_A AS optionally responds with the 100 Trying to IMS_A
												IMS_A AS applies the CDIV CFU procedure
20					←	←	←		←	←	181 Call is being	IMS_A AS indicates optionally to IMS_A that call has been forwarded
21					→						181 Call is being	IMS_A indicates to IBCF_A that call has been forwarded
22						→	→				181 Call is being	IBCF_A indicates to IBCF_B that call has been forwarded
23							→		→		181 Call is being	IBCF_B indicates to IMS_B that call has been forwarded
24							←		←		181 Call is being	IMS_B indicates to IBCF_B that call has been forwarded
25						←	←				181 Call is being	IBCF_B indicates to IBCF_A that call has been forwarded
26					←	←					181 Call is being	IBCF_A indicates to IMS_A that call has been forwarded
27				←	←						181 Call is being	IMS_A indicates to UE_B that call to UE_A has been forwarded
28			←	←								User B may be informed of call diversion
29					←	←	←		←	←	INVITE	IMS_A AS returns modified INVITE including new request URI and history header to IMS_A
30					→	→	→		→	→	100 Trying	IMS_A responds with a 100 Trying provisional response
31		←	←	←	←						INVITE	IMS_A forwards the INVITE to UE_A2

Step	Direction										Message	Comment
	User A2	UE A2	User B	UE B	IMS A	IBCF A	IBCF B	ENUM DB	IMS B	ASA		
32		→			→						100 Trying	UE_A2 optionally responds with a 100 Trying provisional response
33	←											User A2 is informed of incoming call of User B
34	→											User A2 answers call
35		→			→						200 OK	UE_A2 responds to INVITE with 200 OK to indicate that the call has been answered
36						→	→	→	→	→	200 OK	IMS_A forwards 200 OK response to IMS_A AS
37					←	←	←	←	←	←	**200 OK**	**IMS_A AS returns, possibly modified, 200 OK to IMS_A**
38					→	→					200 OK	**IMS_A forwards 200 OK response to IBCF_A**
39						→	→				200 OK	**IBCF_A forwards 200 OK response to IBCF_B**
40							→	→	→		**200 OK**	**IBCF_B forwards 200 OK response to IMS_B**
41							←	←	←		200 OK	IMS_B forwards 200 OK response to IBCF_B
42						←	←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
43					←	←					200 OK	IBCF_A forwards 200 OK response to IMS_A
44				←	←						200 OK	IMS_A forwards 200 OK response to UE_B
45			←	←								User B is informed that call has been answered

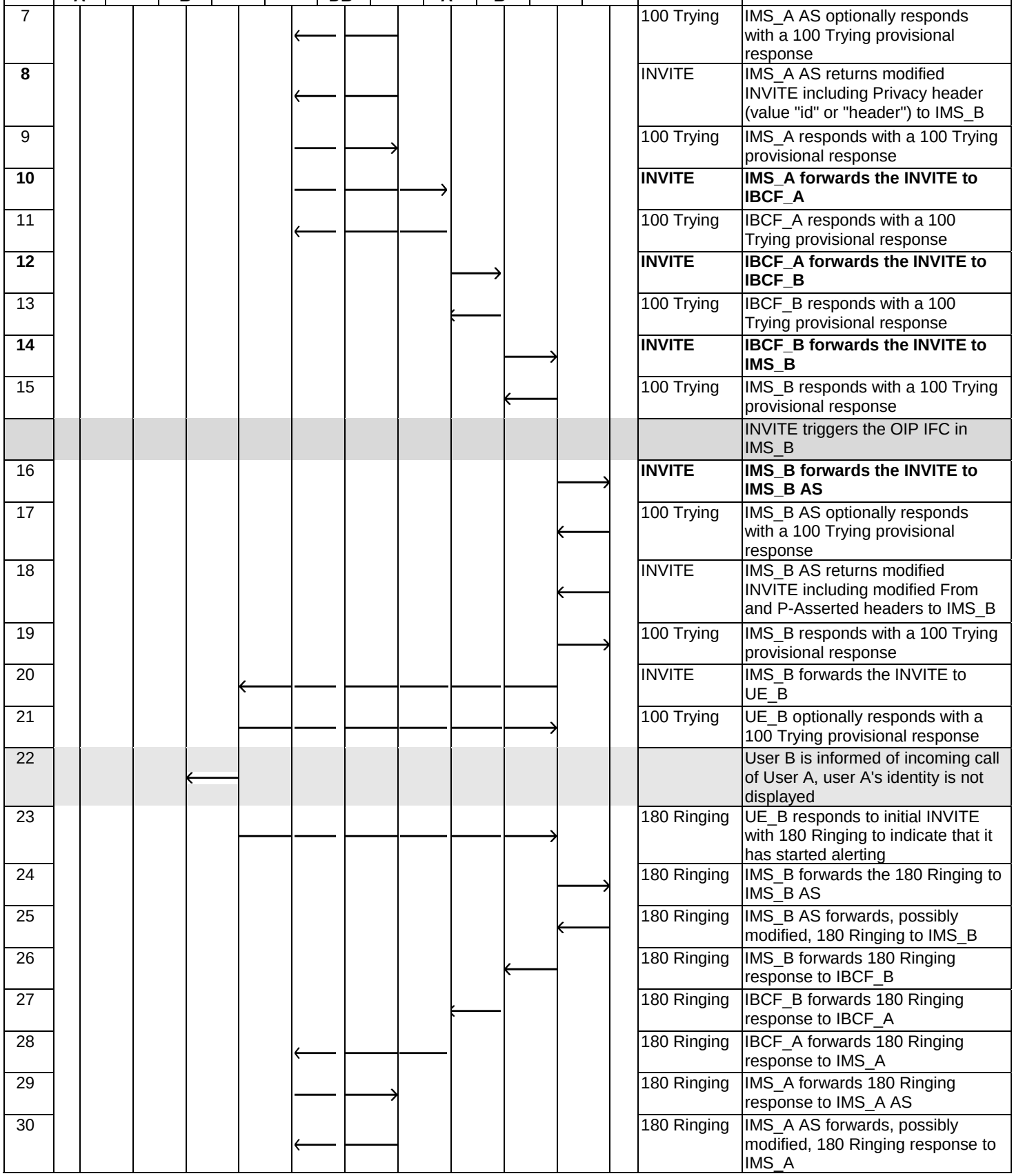
4.5.5.9 Supplementary Services OIP and OIR with AS

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 120 (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 16 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter) }* *}*

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	ASA	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						→						ENUM	IMS B sends query to ENUM DB
5						←						ENUM	ENUM DB sends response to IMS B
													INVITE triggers the OIR IFC in IMS_A
6						—	→					INVITE	IMS_A forwards the INVITE to IMS_A AS



Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	AS A	IBCF A	IBCF B	IMS B	AS B		
7												100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
8												INVITE	IMS_A AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
9												100 Trying	IMS_A responds with a 100 Trying provisional response
10												**INVITE**	**IMS_A 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 IBCF_B**
13												100 Trying	IBCF_B responds with a 100 Trying provisional response
14												**INVITE**	**IBCF_B forwards the INVITE to IMS_B**
15												100 Trying	IMS_B responds with a 100 Trying provisional response
													INVITE triggers the OIP IFC in IMS_B
16												**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**
17												100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
18												INVITE	IMS_B AS returns modified INVITE including modified From and P-Asserted headers to IMS_B
19												100 Trying	IMS_B responds with a 100 Trying provisional response
20												INVITE	IMS_B 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 not displayed
23												180 Ringing	UE_B responds to initial INVITE with 180 Ringing to indicate that it has started alerting
24												180 Ringing	IMS_B forwards the 180 Ringing to IMS_B AS
25												180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing to IMS_B
26												180 Ringing	IMS_B forwards 180 Ringing response to IBCF_B
27												180 Ringing	IBCF_B forwards 180 Ringing response to IBCF_A
28												180 Ringing	IBCF_A forwards 180 Ringing response to IMS_A
29												180 Ringing	IMS_A forwards 180 Ringing response to IMS_A AS
30												180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing response to IMS_A

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	ENUM DB	AS A	IBCF A	IBCF B	IMS B	AS B		
31		←			←							180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
32	←												User A is informed that UE_B is ringing
33			→										User B answers call
34				→	→		→	→	→	→		200 OK	UE_B responds INVITE with 200 OK to indicate that the call has been answered
35										→		200 OK	IMS_B forwards the 200 OK to IMS_B AS
36										←		200 OK	IMS_B AS forwards, possibly modified, 200 OK to IMS_B
37									←			200 OK	IMS_B forwards 200 OK response to IBCF_B
38								←				200 OK	IBCF_B forwards 200 OK response to IBCF_A
39					←							200 OK	IBCF_A forwards 200 OK response to IMS_A
40						→	→					200 OK	IMS_A forwards 200 OK response to IMS_A AS
41					←							200 OK	IMS_A AS forwards, possibly modified, 200 OK response to IMS_A
43		←			←							200 OK	IMS_A forwards the 200 OK response to UE_A
44	←												User A is informed that call has 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 12 (INVITE) *ensure that {* *when { IUT receives an initial INVITE from IMS_A addressed_to UE_A }* *then { IUT sends the initial INVITE to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header and* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter and* *containing an access-network-charging-info_parameter) }* *}*

Interoperability Test Description		
	3	TP_IMS_5308_01 in CFW step 30 (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 44 (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	**UEA**	**User B**	**UEB**	**IMSA**	**ASA**	**IBCFA**	**IBCFB**	**ENUMDB**	**IMSB**	**ASB**		
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
10									←			ENUM	IMS B sends query to ENUM DB
11									→			ENUM	ENUM DB sends response to IMS B
													INVITE triggers the OIR IFC in IMS_B
12										→		**INVITE**	**IMS_B forwards the INVITE to IMS_B AS**

Step	Direction											Message	Comment
	User A	UE A	User B	UE B	IMS A	AS A	IBCF A	IBCF B	ENUM DB	IMS B	AS B		
13										←		100 Trying	IMS_B AS optionally responds with a 100 Trying provisional response
14										←		INVITE	IMS_B AS returns modified INVITE including Privacy header (value "id" or "header") to IMS_B
15										→		100 Trying	IMS_B responds with a 100 Trying provisional response
16								←	→			INVITE	IMS_B forwards the INVITE to IBCF_B
17								→	→			100 Trying	IBCF_B responds with a 100 Trying provisional response
18							←					INVITE	IBCF_B forwards the INVITE to IBCF_A
19							→					100 Trying	IBCF_A responds with a 100 Trying provisional response
20					←	←						INVITE	IBCF_A forwards the INVITE to IMS_A
21					→	→						100 Trying	IMS_A responds with a 100 Trying provisional response
													INVITE triggers the OIP IFC in IMS_A
22					→							INVITE	IMS_A forwards the INVITE to IMS_A AS
23					←							100 Trying	IMS_A AS optionally responds with a 100 Trying provisional response
24					←							INVITE	IMS_A AS returns modified INVITE including modified From and P-Asserted headers to IMS_A
25					→							100 Trying	IMS_A responds with a 100 Trying provisional response
26		←		←								INVITE	IMS_A forwards the INVITE to UE_A
27		→		→								100 Trying	UE_A optionally responds with a 100 Trying provisional response
28	←												User A is informed of incoming call of User B, user B's identity is not displayed
29		→		→								180 Ringing	UE_A responds to initial INVITE with 180 Ringing to indicate that it has started alerting
30					→							**180 Ringing**	**IMS_A forwards the 180 Ringing to IMS_A AS**
31					←							180 Ringing	IMS_A AS forwards, possibly modified, 180 Ringing to IMS_A
32					→	→						180 Ringing	IMS_A forwards 180 Ringing response to IBCF_A
33							→					180 Ringing	IBCF_A forwards 180 Ringing response to IBCF_B
34								→	→			180 Ringing	IBCF_B forwards 180 Ringing response to IMS_B
35										→		180 Ringing	IMS_B forwards 180 Ringing response to IMS_B AS

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IBCFA	IBCFB	ENUMDB	IMSB	ASB		
36												180 Ringing	IMS_B AS forwards, possibly modified, 180 Ringing response to IMS_B
37												180 Ringing	IMS_B forwards the 180 Ringing response to IBCF_B
38												180 Ringing	IBCF_B forwards the 180 Ringing response to IBCF_A
39												180 Ringing	IBCF_A forwards the 180 Ringing response to IMS_A
40												180 Ringing	IMS_A forwards the 180 Ringing response to UE_B
41													User B is informed that UE_A is ringing
42													User A answers call
43												200 OK	UE_A responds INVITE with 200 OK to indicate that the call has been answered
44												**200 OK**	**IMS_A forwards the 200 OK to IMS_A AS**
45												200 OK	IMS_A AS forwards, possibly modified, 200 OK to IMS_A
46												200 OK	IMS_A forwards 200 OK response to IBCF_A
47												200 OK	IBCF_A forwards 200 OK response to IBCF_B
48												200 OK	IBCF_B forwards 200 OK response to IMS_B
49												200 OK	IMS_B forwards 200 OK response to IMS_B AS
50												200 OK	IMS_B AS forwards, possibly modified, 200 OK response to IMS_B
51												200 OK	IMS_B forwards the 200 OK response to IBCF_B
52												200 OK	IBCF_B forwards the 200 OK response to IBCF_A
53												200 OK	IBCF_A forwards the 200 OK response to IMS_A
54												200 OK	IMS_A forwards the 200 OK response to UE_B
55													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 (7^{th} numbered list)

Interoperability Test Description		
Use Case ref.:	UC_16	
Pre-test conditions:	• HSS of IMS_A and of IMS B is configured according to table 1 • UE_A and UE_B have IP bearers established to their respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity • IMS_A is configured to contact AS_A (CONF) • UE_B is registered in IMS_B using any user identity • IMS_B is configured to contact AS_B (CONF) • User A and B are subscribed to CONF service • User A is pre-provisioned with conference-factory URI in IMS_A	
Test Sequence:	**Step**	
	1	User A initiates an ad-hoc conference call with a pre-configured conference-factory URI
	2	Verify that User A is informed the Ad Hoc Conference Call is being set up
	3	Verify that User A is informed the Ad Hoc Conference Call is established
	4	User A invites User B to join the Conference Call.
	5	Verify that User B is informed of incoming invitation from User A to join the Conference Call
	6	Verify that User A is informed that User B is being alerted
	7	User B joins the Conference Call
	8	Verify that User A is alerted when User B joins the Conference Call
	9	User B leaves the Conference Call
	10	Verify that User B is informed that the Conference Call has ended
	11	Verify that User A is alerted when User B leaves the Conference Call
Conformance Criteria:	**Check**	
	1	TP_IMS_5121_02 in CFW in step 36 & 46 (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	ENUM DB	ASA	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 presence elements
3		←		—	—							100 Trying	IMS_A responds with a 100 Trying provisional response
4	←												User A is informed the Ad Hoc Conference Call is being set up
5					—	→	→					INVITE	IMS_A forwards INVITE to IMS_A AS
6					—	—						100 Trying	IMS_A AS responds with a 100 Trying provisional response
7					—	—						200 OK	IMS_A AS responds with a 200 OK to IMS_A, with isfocus parameter
8		←		—	—							200 OK	IMS_A forwards the 200OK response to UE_A

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUM DB	ASA	IBCFA	IBCFB	IMSB	ASB		
9	←												User A is informed the Ad Hoc Conference Call is established
10		→	→	→								ACK	UE_A acknowledges the receipt of 200 OK for INVITE
11					→	→						ACK	IMS_A forwards the ACK to IMS_A AS
12	→												User A invites user B to join the ad-hoc conference call
13		→	→	→								REFER	UE_A sends REFER message to IMS_A, with Refer-To : <UE_B uri ;method=INVITE>
14					→	→						REFER	IMS_A forwards the REFER to IMS_A AS
15					←							202 Accepted	IMS_A AS responds with a 202 Accepted
16		←										202 Accepted	IMS_A forwards the 202 Accepted response to UE_A
17					→	→						NOTIFY	IMS_A AS sends a NOTIFY to IMS_A to inform the conference initiator the REFER message is being processed
18		←										NOTIFY	IMS_A forwards the NOTIFY to UE_A
19		→	→	→								200 OK	UE_A responds with 200 OK to IMS_A
20					→	→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
21					←							INVITE	IMS_A AS sends INVITE to UE_B with conference-factory URI (received in the REFER message from UE A)
22					→	→						100 Trying	IMS_A responds with a 100 Trying provisional response
23					→							ENUM	IMS_A sends query to ENUM DB
24					←							ENUM	ENUM DB sends response to IMS_A
25					→	→	→					INVITE	IMS_A forwards the INVITE to IBCF_A
26					←	→	→					100 Trying	IBCF_A responds with a 100 Trying provisional response
27									→			INVITE	IBCF_A forwards the INVITE to IBCF_B
28									←			100 Trying	IBCF_B responds with a 100 Trying provisional response
29										→		INVITE	IBCF_B forwards the INVITE to IMS_B
30										←		100 Trying	IMS_B responds with a 100 Trying provisional response
31				←	→	→	→	→	→			INVITE	IMS_B forwards the INVITE to UE_B
32				→	→	→	→	→	→	→		100 Trying	UE_B responds with a 100 Trying provisional response
33			←										User B is informed of incoming invitation from User A to join the Conference Call
34				→	→	→	→	→	→	→		180 Ringing	UE_B sends a 180 ringing to IMS_B
35									←	←		180 Ringing	IMS_B forwards the 180 ringing to IBCF_B

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	ASA	IBCFA	IBCFB	IMSB	ASB		
36									←			180 Ringing	IBCF_B forwards the 180 ringing to IBCF_A
37					←							180 Ringing	IBCF_A forwards the 180 ringing to IMS_A
38						→						180 Ringing	IMS_A forwards the 180 ringing to IMS_A AS
39					←							NOTIFY	Upon reception of 180 Ringing from UE_B, IMS_A AS sends NOTIFY with sipfrag: 180 Ringing to inform conference initiator that UE_B is being invited to join the conference
40		←										NOTIFY	IMS_A forwards the NOTIFY to UE_A
41	←												User A is notified that User B is being invited to join the call
42		→		→								200 OK	UE_A responds with 200 OK to IMS_A for NOTIFY
43						→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
44				→						→		**200 OK**	**UE_B responds with 200 OK to IMS_B for INVITE**
45									←			**200 OK**	**IMS B forwards the 200 OK response to IBCF_B**
46									←			200 OK	IBCF_B forwards the 200 OK response to IBCF_A
47					←							200 OK	IBCF_A forwards the 200 OK response to IMS_A
48						→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
49			→										User B joins the conference
50				→						→		ACK	UE_B acknowledges the 200 OK for INVITE
51									←			ACK	IMS B forwards the ACK to IBCF_B
52									←			ACK	IBCF_B forwards the ACK to IBCF_A
53					←							ACK	IBCF_A forwards the ACK to IMS_A
54						→						ACK	IMS_A forwards the ACK to IMS_A AS
55					←							NOTIFY	AS_A sends NOTIFY to UE_A to inform it has successfully joined the conference
56		←										NOTIFY	IMS_A forwards NOTIFY to UE_A
57	←												User A is alerted that User B has joined the conference
58		→		→								200 OK	UE_A sends 200 OK response for NOTIFY
59						→						200 OK	IMS_A forwards the 200 OK response to IMS_A AS
60			→										User B leaves the conference
61				→						→		BYE	UE_B sends BYE to IMS_B to leave the conference
62									←			BYE	IMS_B forwards the BYE to IBCF_B
63									←			BYE	IBCF_B forwards the BYE to IBCF_A
64					←							BYE	IBCF_A forwards the BYE to IMS_A

Step	Direction											Message	Comment
	User A	UEA	User B	UEB	IMSA	ENUMDB	ASA	IBCFA	IBCFB	IMSB	ASB		
65												BYE	IMS_A forwards the BYE to IMS_A AS
66												200 OK	IMS_A AS releases resources for this conference caller and sends a 200 OK response for BYE
67												200 OK	IMS_A forwards the 200 OK response to IBCF_A
68												200 OK	IBCF_A forwards the 200 OK response to IBCF_B
69												200 OK	IBCF_B forwards the 200 OK response to IMS_B
70												200 OK	IMS_B forwards the 200 OK response to UE_B
71													User B is informed that the conference has ended
72												NOTIFY	AS_A sends NOTIFY to IMS _A to inform UE_A that UE_B has left the conference
73												NOTIFY	IMS_A forwards NOTIFY to UE_A
74													User A is notified that user B has left the conference
75												200 OK	UE_A sends a 200 OK response for NOTIFY
76												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 [16].

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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_5206_01 in CFW step 23 (REGISTER) *ensure that {* *when { IUT receives a protected REGISTER from UE_B* *containing an Authorization_header* *including an integrity-protected_parameter* *set to yes or* *set to tls-pending or* *set to tls-yes or* *set to ip-assoc-pending or* *set to ip-assoc-yes* *}* *then { IUT sends the REGISTER to AS_B* *containing a P-Access-Network-Info_header and* *containing a P-Visited-Network-ID_header* *}* *}*
	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
Conformance Criteria:	**Check**	
	1	TP_IMS_5097_14 in CFW step 24 (SUBSCRIBE): *ensure that {* *when { IUT receives a SUBSCRIBE from IMS_A from UE_B }* *then {IUT sends the SUBSCRIBE to AS_B* *containing a Route_header* *indicating the SIP_URI of AS_B and* *containing a P-Charging-Function-Addresses_header and* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing a term-ioi_parameter and* *containing an access-network-charging-info_parameter) }* *}*
	2	TP_IMS_5308_02 in CFW step 30 (200 OK) *ensure that {* *when { IUT receives a 200_response from UE_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *then { IUT sends the 200_response to AS_A* *containing a P-Charging-Vector_header* *including an access-network-charging-info_parameter* *}* *}*

Step	Direction								Message	Comment
	User A	UEA	User B	UEB	IMSA	ASA	IMSB	ASB		
										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 6th 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

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 addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing 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 6th 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	
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 addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing 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 6th 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 addressed_to UE_B}* *then { IUT sends the INVITE to AS_B* *containing a topmost Route_header* *indicating the SIP_URI of AS_B and* *containing a Route_header* *indicating the S-CSCF_SIP_URI of IUT_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing 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 { IUT receives a MESSAGE from IMS_A addressed_to UE_B}* *then { IUT sends the MESSAGE 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_* *containing a P-Charging-Vector_header* *(containing an orig-ioi_parameter* *indicating IMS_A and* *not containing 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 ENUM Query - IMS-to-PSTN call

Interoperability Test Description		
Identifier:	TD_IMS_ENUM_0002	
Summary:	ENUM query should result in return of NAPTR with correct Tel URI	
Configuration:	CF_INT_CALL	
SUT:	ENUM _A and ENUM_DB	
References:	**Test Purpose**	**Specification Reference**
	TP_IMS_ENUM_01	TS 124 229 [1], clause 5.4.3.2 ¶11 (item 10 in 1st numbered list)
Use Case ref.:	UC_I_23	
Pre-test conditions:	• ENUM DB is configured according to table 1 • IMS_A is configured to support ENUM • HSS of IMS_A and of IMS B is configured according to table 1 • UE_A has IP bearer established to its respective IMS networks as per clause 4.2.1 • UE_A is registered in IMS_A using any user identity	
Test Sequence:	**Step**	
	1	User A calls user B
	2	User B is informed about incoming call of user B
Conformance Criteria:	**Check**	
	1	TP_IMS_ENUM_01 in CFW step 4 (NAPTR Response): *ensure that {* *when { UE_A sends an initial INVITE for UE_B to IMS_A* *containing a Request_URI* *indicating a Tel_URI* *and IMS_A sends a NAPTR_Query to ENUM_DB* *containing the TN derived_from the Tel_URI_E.164_Number* *}* *then { ENUM_DB sends a NAPTR_Response to IMS_A* *containing a NAPTR_Resource_Record* *containing the TTL of the NAPTR_record* *containing the service_type* *indicating E2U+sip* *containing the_regular_expressiob* *indicating !^(.*)$!* *containing the SIP_URI of UE_B* *indicating backreference (\1) for the user part* *indicating domain name for the host part* *containing SIP_URI_parameters 'if applicable' }* *}*

Step	**Direction**							**Message**	**Comment**
	User A	**UE A**	**IMS A**	**ENUM DB**	**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 UE_A supports
3			→					ENUM	IMS_A sends query to ENUM DB
4			←					ENUM	ENUM DB sends response to IMS_A

Step	Direction							Message	Comment
	User A	UEA	IMSA	ENUMDB	MGCF	PSTN	User B		
5		←						100 Trying	IMS_A responds with a 100 Trying provisional response
6			→		→			INVITE	IMS_A forwards INVITE to MGCF
7			←		←			100 Trying	MGCF responds with a 100 Trying provisional response
8			←		←			183 Session Progress	MGCF responds with 183 Session Progress response
9		←						183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
10		→						PRACK	UE_A sends PRACK to IMS_A
11			→		→			PRACK	IMS_A forwards PRACK to MGCF
12			←		←			200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
13		←						200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
14					→	→		IAM	MGCF sends IAM to PSTN
15						→			User B is informed of incoming call of User A

4.5.8.1.2 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 [17], clause 7.2.3.1.4
	TP_IMS_MGCF_07	TS 124 229 [1], clause 5.4.1.2.2 TS 129 163 [17], clause 7.2.3.1.5
	TP_IMS_MGCF_08	TS 124 229 [1], clause 5.5.4.1 TS 129 163 [17], clause 7.2.3.1.8
Use Case ref.:	UC_23	
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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_02 in CFW step 7 (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 7 and 8 (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 17 (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 22 (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 32B (BYE): *ensure that {* *when { IUT receives an REL from PSTN}* *then { IUT sends a BYE to IMS_A* *}* *}*

Step	**Direction**	**Message**	**Comment**
	User A / **UEA** / **IMSA** / **ENUMDB** / **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 UE_A supports
3	←	100 Trying	IMS_A responds with a 100 Trying provisional response
4	→	ENUM	IMS_A sends query to ENUM DB
5	←	ENUM	ENUM DB sends response to IMS_A
6	→	INVITE	IMS_A forwards INVITE to MGCF
7	←	100 Trying	MGCF responds with a 100 Trying provisional response
8	←	183 Session Progress	MGCF responds with 183 Session Progress response
9	←	183 Session Progress	IMS_forwards 183 Session Progress response to UE_A

Step	Direction							Message	Comment
	User A	UE A	IMS A	ENUM DB	MGCF	PSTN	User B		
10		→						PRACK	UE_A sends PRACK to IMS_A
11			→	→				PRACK	IMS_A forwards PRACK to MGCF
12			←	←				200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
13		←	←					200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
14					→	→		IAM	MGCF sends IAM to PSTN
15						→	→		User B is informed of incoming call of User A
16					←	←		ACM/CPG	PSTN responds with ACM/CPG
17			←	←				180 Ringing	MGCF sends 180 Ringing response to IMS_A
18		←	←					180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
19	←	←							User A is informed that UE_B is ringing
20						←	←		User B answers call
21					←	←		ANM	PSTN sends ANM to MGCF
22			←	←				200 OK	MGCF sends 200 OK response to IMS_A
23		←	←					200 OK	IMS_A forwards 200 OK response to UE_A
24	←	←							User A is informed that call has been answered
25		→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
26			→	→				ACK	IMS_A forwards ACK to MGCF
27									User A and B can communicate
28B						←	←		User B ends call
29B					←	←		REL	PSTN sends BYE to MGCF
30B					→	→		RLC	MGCF responds RLC to PSTN
31B						→	→		User B is informed that call has ended
32B			←	←				BYE	MGCF sends BYE to IMS_A
33B		←	←					BYE	IMS_A forwards BYE to UE_A
34B	←	←							User A is informed that call has ended
35B		→						200 OK	UE_A sends 200 OK for BYE
36B			→	→				200 OK	IMS_A forwards 200 OK response to MGCF

4.5.8.1.3 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 [17], clause 7.2.3.1.4
	TP_IMS_MGCF_07	TS 124 229 [1], clause 5.4.1.2.2 TS 129 163 [17], clause 7.2.3.1.5
	TP_IMS_MGCF_17	TS 129 163 [17], clause 7.2.3.2.13
Use Case ref.:	UC_23	
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 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 7 (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 7 and 8 (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 17 (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 22 (200 OK): *ensure that {* *when { IUT receives an ANM from PSTN}* *then { IUT sends a 200_response to IMS_A* *}* *}*

Interoperability Test Description		

	5	TP_IMS_MGCF_29A in CFW step 31A (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	ENUMDB	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 UE_A supports
3		←						100 Trying	IMS_A responds with a 100 Trying provisional response
4			→					ENUM	IMS_A sends query to ENUM DB
5			←					ENUM	ENUM DB sends response to IMS_A
6			→	→				INVITE	IMS_A forwards INVITE to MGCF
7			←	—				100 Trying	MGCF responds with a 100 Trying provisional response
8			←	—				183 Session Progress	MGCF responds with 183 Session Progress response
9		←						183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
10		→						PRACK	UE_A sends PRACK to IMS_A
11			→	→				PRACK	IMS_A forwards PRACK to MGCF
12			←	—				200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
13		←						200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
14					→			IAM	MGCF sends IAM to PSTN
15						→			User B is informed of incoming call of User A
16					←			ACM/CPG	PSTN responds with ACM/CPG
17			←	—				180 Ringing	MGCF sends 180 Ringing response to IMS_A
18		←						180 Ringing	IMS_A forwards the 180 Ringing response to UE_A
19	←								User A is informed that UE_B is ringing
20						←			User B answers call
21					←			ANM	PSTN sends ANM to MGCF
22			←	—				200 OK	MGCF sends 200 OK response to IMS_A
23		←						200 OK	IMS_A forwards 200 OK response to UE_A

Step	Direction							Message	Comment
	User A	UEA	IMSA	ENUMDB	MGCF	PSTN	User B		
24	←								User A is informed that call has been answered
25		→						ACK	UE_A acknowledges the receipt of 200 OK for INVITE
26			→	→				ACK	IMS_A forwards ACK to MGCF
27									User A and B can communicate
28A	→								User A ends call
29A		→						BYE	UE_A sends BYE
30A			→	→				BYE	IMS_A forwards BYE to MGCF
31A					→			REL	MGCF sends REL to PSTN
32A						→			User B is informed that call has ended
33A					←			RLC	PSTN sends RLC response to MGCF
34A			←					200 OK	MGCF sends 200 OK response to IMS_A
35A		←						200 OK	IMS_A forwards the 200 OK response to UE_A
36A	←								User A is informed that call has ended

4.5.8.1.4 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 [17], clause 7.2.3.1.8
Use Case ref.:	UC_23	
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

Interoperability Test Description		
Conformance Criteria:	**Check**	
	1	TP_IMS_MGCF_02 in CFW step 8 (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 18 (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	ENUMDB	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 UE_A supports
4		←						100 Trying	IMS_A responds with a 100 Trying provisional response
5			→					ENUM	IMS_A sends query to ENUM DB
6			←					ENUM	ENUM DB sends response to IMS_A
7			—	→				INVITE	IMS_A forwards INVITE to MGCF
8			←	—				100 Trying	MGCF responds with a 100 Trying provisional response
9			←	—				183 Session Progress	MGCF responds with 183 Session Progress response
10		←						183 Session Progress	IMS_forwards 183 Session Progress response to UE_A
11		→						PRACK	UE_A sends PRACK to IMS_A
12			—	→				PRACK	IMS_A forwards PRACK to MGCF
13			←	—				200 OK (PRACK)	MGCF responds with 200 OK response to IMS_A
14		←						200 OK (PRACK)	IMS_A forwards 200 OK response to UE_A
15					→			IAM	MGCF sends IAM to PSTN
16					←			REL (cause #17)	PSTN responds with REL “user busy”
17					→			RLC	MGCF sends RLC to PSTN
18			←	—				486 Busy Here	MGCF sends 486 Busy Here response to IMS_A
19		←						486 Busy Here	IMS_A forwards 486 Busy Here response to UE_A
20	←								User A is informed that User B is busy
21		→						ACK	UE_A acknowledges the receipt of 486 for INVITE
22			—	→				ACK	IMS_A forwards ACK to MGCF

4.5.8.1.5 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 [17], clause 7.4.10.1
	TP_IMS_MGCF_12	TS 129 163 [17], clause 7.4.10.1
Use Case ref.:	UC_23	
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 33 (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 39 (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	**UE A**	**IMS A**	**ENUM DB**	**MGCF**	**PSTN**	**User B**			
										Follow UC_23 (1-26)
27										User A and B can communicate
28										User A sets B on hold
29			→						UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendonly) to IMS_A
30				→	→				UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to MGCF

Step	Direction							Message	Comment
	User A	UEA	IMSA	ENUMDB	MGCF	PSTN	User B		
31			←					200 OK (UPDATE/INVITE)	MGCF replies 200 OK to IMS_A
32		←						200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to UE_A
33					→			CPG	MGCF sends CPG “remote HOLD”
34									User A and B cannot communicate
35		→						UPDATE/Re-INVITE	UE_A sends UPDATE/Re-INVITE (sendrecv) to IMS_A
36			→		→			UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to MGCF
37			←		←			200 OK (UPDATE/INVITE)	MGCF replies 200 OK to IMS_A
38		←						200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to UE_A
39					→			CPG	MGCF sends CPG "remote RETRIEVE"
40									User A and B can communicate
41						←			User B ends call
									Continue UC_23 (28B-36B)

4.5.8.1.6 PSTN user holds/resumes call

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0005	
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 [17], clause 7.4.10.2
	TP_IMS_MGCF_14	TS 129 163 [17], clause 7.4.10.2
Use Case ref.:	UC_23	
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

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 in CFW step 39 (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	ENUMDB	MGCF	PSTN	User B		
									Follow UC_23 (1-26)
27									User A and B can communicate
28									User B sets A on hold
29					←			CPG	MGCF receives CPG with remote HOLD
30			←					UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendonly) to IMS_A
31		←						UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendonly) to UE_A
32		→						200 OK (UPDATE/INVITE)	UE_A replies 200 OK to IMS_A
33			→					200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to MGCF
34									User A and B cannot communicate
35					←			CPG	MGCF receives CPG with remote RETRIEVE
36			←					UPDATE/Re-INVITE	MGCF sends UPDATE/Re-INVITE (sendrecv) to IMS_A
37		←						UPDATE/Re-INVITE	IMS_A forwards UPDATE/Re-INVITE (sendrecv) to UE_A
38		→						200 OK (UPDATE/INVITE)	UE_A replies 200 OK to IMS_A
39			→					200 OK (UPDATE/INVITE)	IMS_A forwards 200 OK to MGCF
40									User A and B can communicate
41						←			User A ends call
									Continue UC_23 (28A-36A)

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 [17], clauses 7.2.3.2.4 and 7.2.3.2.6
	TP_IMS_MGCF_16	TS 129 163 [17], clause 7.2.3.2.8
	TP_IMS_MGCF_08	TS 124 229 [1], clause 5.5.4.1 TS 129 163 [17], clause 7.2.3.1.8
Use Case ref.:	UC_24	
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* *}* *}*

Interoperability Test Description		
	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 "telephone-event", clause 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
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 [17], clauses 7.2.3.2.4 and 7.2.3.2.6
	TP_IMS_MGCF_16	TS 129 163 [17], clause 7.2.3.2.8
	TP_IMS_MGCF_17	TS 129 163 [17], clause 7.2.3.2.13
Use Case ref.:	UC_24	
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 "telephone-event" clause 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
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

Step	Direction						Message	Comment
	User A	UEA	IMSA	MGCF	PSTN	User B		
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

4.5.8.2.3 Unsuccessful Call, IMS user busy

Interoperability Test Description		
Identifier:	TD_IMS_PSTN_0008	
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 [17], clause 7.2.3.2.12
Use Case ref.:	UC_24	
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 "telephone-event", clause 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		→					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 [17], clause 7.4.10.1
	TP_IMS_MGCF_12	TS 129 163 [17], clause 7.4.10.1
Use Case ref.:	UC_24	
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 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 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 [17], clause 7.4.10.2
	TP_IMS_MGCF_14	TS 129 163 [17], clause 7.4.10.2
Use Case ref.:	UC_24	
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 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
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	UEA	IMSA	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)

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