

ETSI TS 124 610 V18.0.0 (2024-05)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
Communication HOLD (HOLD) using IP Multimedia (IM)
Core Network (CN) subsystem;
Protocol specification
(3GPP TS 24.610 version 18.0.0 Release 18)**



Reference

RTS/TSGC-0124610vi00

Keywords

5G,GSM,LTE,UMTS

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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from:

<https://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2024.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <https://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	6
4 Communication Hold (HOLD)	7
4.1 Void.....	7
4.2 Description	7
4.2.1 General description	7
4.3 Operational requirements	7
4.3.1 Provision/withdrawal	7
4.3.2 Requirements on the originating network side.....	7
4.3.3 Requirements in the network	7
4.3.4 Requirements on the terminating network side.....	7
4.4 Coding requirements	7
4.5 Signalling requirements.....	8
4.5.1 Activation/deactivation	8
4.5.2 Invocation and operation	8
4.5.2.1 Actions at the invoking UE	8
4.5.2.2 Void.....	9
4.5.2.3 Void.....	9
4.5.2.4 Actions at the AS of the invoking UE.....	9
4.5.2.4.1 General	9
4.5.2.4.2 Bandwidth management	9
4.5.2.4.3 Announcements	9
4.5.2.4.4 Resource sharing	9
4.5.2.5 Void.....	10
4.5.2.6 Void.....	10
4.5.2.7 Void.....	10
4.5.2.8 Void.....	10
4.5.2.9 Actions at the held UE	10
4.6 Interaction with other services.....	10
4.6.1 Communication Hold (HOLD).....	10
4.6.2 Terminating Identification Presentation (TIP).....	11
4.6.3 Terminating Identification Restriction (TIR).....	11
4.6.4 Originating Identification Presentation (OIP).....	11
4.6.5 Originating identification restriction (OIR)	11
4.6.6 Conference calling (CONF).....	11
4.6.7 Communication DIVersion services (CDIV).....	11
4.6.8 Malicious Communication IDentification (MCID)	11
4.6.9 Anonymous Communication Rejection and Communication Barring (ACR/CB)	11
4.6.10 Explicit Communication Transfer (ECT)	11
4.6.11 Enhanced Calling Name (eCNAM)	11
4.6.12 Multi-Device (MuD).....	11
4.6.13 Multi-Identity (MiD).....	11
4.7 Interactions with other networks	12
4.7.1 Void	12
4.7.2 Void	12
4.7.3 Void	12
4.8 Parameter values (timers)	12

Annex A (informative):	Signalling Flows	13
A.1	HOLD communication	13
A.1.1	HOLD communication without announcement	13
A.1.2	HOLD communication with announcement	15
A.1.3	HOLD communication with modification of the SDP answer	17
A.2	RESUME Communication	20
A.2.1	RESUME communication without announcement	20
A.2.2	RESUME communication with announcement	22
Annex B (informative):	Example of filter criteria	25
Annex C (informative):	Change history	26
History		27

Foreword

This Technical Specification (TS) was been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN) and originally published as ETSI TS 183 010 [7]. It was transferred to the 3rd Generation Partnership Project (3GPP) in December 2007.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the stage three Protocol Description of the Communication Hold (HOLD) services, based on stages one and two of the ISDN Hold (HOLD) supplementary services. It provides the protocol details in the IP Multimedia (IM) Core Network (CN) subsystem based on the Session Initiation Protocol (SIP) and the Session Description Protocol (SDP).

The present document is applicable to User Equipment (UE) and Application Servers (AS) which are intended to support the HOLD supplementary service.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".
- [2] Void.
- [3] Void
- [4] IETF RFC 3264 (2002): "An Offer/Answer Model with the Session Description Protocol (SDP)".
- [5] 3GPP TS 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1".
- [6] 3GPP TS 24.628: "Common Basic Communication procedures; Protocol specification".
- [7] ETSI TS 183 010 V1.2.2: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Signalling Control Protocol; Communication HOLD (HOLD) PSTN/ISDN simulation services; Protocol specification".
- [8] IETF RFC 7090 (April 2014): "Public Safety Answering Point (PSAP) Callback".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 22.173 [5] apply.

3.2 Abbreviations

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

ACR/CB	Anonymous Communication Rejection and Communication Barring
AS	SIP Application Server
CDIV	Communication DIVersion
CSCF	Call Session Control Function

ECT	Explicit Communication Transfer
HOLD	communication session HOLD
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ISDN	Integrated Service Digital Network
MCID	Malicious Communication IDentification
MiD	Multi-iDentity
MuD	Multi-Device
OIP	Originating Identification Presentation
OIR	Originating Identification Restriction
P-CSCF	Proxy-CSCF
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
S-CSCF	Serving-CSCF
SDP	Session Description Protocol
SIP	Session Initiation Protocol
TIP	Terminating Identification Presentation
TIR	Terminating Identification Restriction
UE	User Equipment

4 Communication Hold (HOLD)

4.1 Void

4.2 Description

4.2.1 General description

The Communication Hold supplementary service enables a user to suspend the reception of media stream(s) of an established IP multimedia session, and resume the media stream(s) at a later time.

4.3 Operational requirements

4.3.1 Provision/withdrawal

The HOLD service that includes announcements shall be provided after prior arrangement with the service provider.

4.3.2 Requirements on the originating network side

No specific requirements are needed in the network.

4.3.3 Requirements in the network

No specific requirements are needed in the network.

4.3.4 Requirements on the terminating network side

No specific requirements are needed in the network.

4.4 Coding requirements

No specific coding requirements are needed.

4.5 Signalling requirements

4.5.1 Activation/deactivation

The HOLD service is activated at provisioning and deactivated at withdrawal.

4.5.1A Registration/erasure

The HOLD service requires no registration. Erasure is not applicable.

4.5.1B Interrogation

Interrogation of HOLD is not applicable.

4.5.2 Invocation and operation

4.5.2.1 Actions at the invoking UE

In addition to the application of procedures according to 3GPP TS 24.229 [1], the following procedures shall be applied at the invoking UE in accordance with RFC 3264 [4].

A UE shall not invoke the HOLD service on a dialog associated with an emergency call the UE has initiated.

If not all the media streams are affected, the invoking UE shall generate a new SDP offer where:

- 1) for each media stream that is to be held, the SDP offer contains:
 - an "inactive" SDP attribute if the stream was previously set to "recvonly"; or
 - a "sendonly" SDP attribute if the stream was previously set to "sendrecv";

NOTE 1: If the directionality attribute of the media stream is currently "sendonly" or "inactive", then that media stream is not put on hold and, in the SDP offer, the directionality for that media stream remains unchanged.

- 2) for each held media stream that is to be resumed, the SDP offer contains:
 - a "recvonly" SDP attribute if the stream was previously an inactive media stream; or
 - a "sendrecv" SDP attribute if the stream was previously a sendonly media stream, or the attribute may be omitted, since sendrecv is the default; and
- 3) for each media stream that is unaffected, the media parameters in the SDP offer remain unchanged from the previous SDP.

If all the media streams are to be held:

- if they all have identical directionality, the invoking UE shall generate an SDP offer containing a session level direction attribute, or separate media level direction attributes, in the SDP that is set to:
 - 1) "inactive" if the streams were previously set to "recvonly"; or
 - 2) "sendonly" if the streams were previously set to "sendrecv"; and

NOTE 2: If the directionality attribute of all the media streams is currently "sendonly" or "inactive", then all these media streams are not put on hold and, in the SDP offer, the directionality for these media streams will remain unchanged.

- if they all do not have identical directionality, then for each media stream in the session, the invoking UE shall follow the procedure listed above for individual media streams.

If all the media streams were previously on hold and are to be resumed:

- if they all have identical directionality, the invoking UE shall generate a session level direction attribute, or separate media level direction attributes, in the SDP that is set to:
 - 1) "recvonly" if the streams were previously inactive media streams; or
 - 2) "sendrecv" if the streams were previously sendonly media streams, or the attribute may be omitted, since sendrecv is the default; and
- if they all do not have identical directionality, then for each media stream in the session, the invoking UE shall follow the procedure listed above for individual media streams.

If, in the generated SDP offer, there is at least one media stream whose directionality has changed from the previous SDP, the UE shall send the generated SDP offer in a re-INVITE request (or UPDATE request) to the remote UE.

4.5.2.2 Void

4.5.2.3 Void

4.5.2.4 Actions at the AS of the invoking UE

4.5.2.4.1 General

The AS shall based on local policy on how to handle PSAP callbacks reject any HOLD invocation request from the served UE by sending a 403 (Forbidden) response.

The mechanism to identify an INVITE request as a PSAP callback depends on local policy and can be based on the PSAP callback indicator specified in IETF RFC 7090 [8].

4.5.2.4.2 Bandwidth management

As a network option, for each media stream marked "recvonly" in the SDP answer sent to the invoking UE, the AS of the invoking UE shall lower the bandwidth by setting the "b=AS:" parameter to a small value, e.g. "b=AS:0". The "b=RR:" and "b=RS:" parameters shall be set to values large enough to enable continuation of the RTCP flow, e.g. "b=RR:800" and "b=RS:800".

As a network option, for each media stream marked "inactive" in the SDP answer sent to the invoking UE, the AS of the invoking UE shall lower the bandwidth by setting the "b=AS:" parameter to a small value, e.g. "b=AS:0". The "b=RR:" and "b=RS:" parameters shall be set to values large enough to enable continuation of the RTCP flow, e.g. "b=RR:800" and "b=RS:800".

NOTE: A media stream in the SDP answer can be marked as "recvonly" at media description level or/and at session description level (i.e. all the media streams are marked "recvonly").

4.5.2.4.3 Announcements

As a network option, the AS of the invoking UE shall initiate the procedures for the provision of an announcement to the held user in accordance with 3GPP TS 24.628 [6]. An announcement is only possible on the media stream that is in sendonly state on the AS after the signalling exchange for HOLD.

NOTE 1: Not providing an announcement allows the service provider to provide the possibility to change from bidirectional to unidirectional media streams.

NOTE 2: A service provider can decide to provide announcements only if a pre-defined set of media streams are put on HOLD.

4.5.2.4.4 Resource sharing

A precondition for the procedures in this subclause are that the AS:

- 1) supports resource sharing;
- 2) knows that the P-CSCF supports resource sharing; and

NOTE 1: The AS can know that the P-CSCF supports resource sharing based on information in the MIME body in a 3rd party REGISTER request or by means outside the scope of the present document.

3) applied the procedures in 3GPP TS 24.229 [1], subclause 5.7.1.20 when the first session to or from the served UE was established.

NOTE 2: The resource sharing procedures related to the HOLD service do not need to use the "resource-sharing-key-list" parameter.

For a session that is identified as an emergency session the AS shall not insert the Resource-Share header field.

When the AS receives a response to a HOLD request from the served UE the AS stores

- the sharing keys; and
- the m-lines in the HOLD response, along with an indication that the m-line is on HOLD.

When the AS receives an SDP answer in a response towards the served UE for an initial originating INVITE from the served UE the AS compares the SDP answer in the received response with any stored SDP for a session involving the same UE. If the m-lines in the stored SDP and the received SDP answer match, then for each held m-line in the stored SDP, the AS associates the sharing-key from the held m-line to the corresponding m-line in the received SDP response. Before forwarding the SDP answer in the INVITE response the AS inserts a Resource-Share header field using these associated sharing-keys for the matching m-lines and indicates in the "rules" parameter the directionality to be "UL-DL" and produces new unique sharing keys for the other m-lines.

When the AS receives a HOLD response towards the served UE, and there is an incoming session in alerting phase for which the AS has associated unique resource sharing keys, the AS compares the SDP in the HOLD response and the previously stored SDP and if they match, the AS associates to the held lines in the HOLD response the sharing keys from the stored m-lines. Before forwarding the HOLD response the AS inserts a Resource-Share header field using these associated sharing-keys for the matching m-lines and indicates in the "rules" parameter the directionality to be "UL-DL" and produces new unique sharing keys for the other m-lines.

When the AS receives a response from the remote UE to a RESUME request for an m-line where there exists an active m-line in another session, the AS shall apply a new unique sharing key to that m-line or set the Resource-Share header field to the value "no-media-sharing".

4.5.2.5 Void

4.5.2.6 Void

4.5.2.7 Void

4.5.2.8 Void

4.5.2.9 Actions at the held UE

3GPP TS 24.229 [1] shall apply.

NOTE: If the media stream is not held by the local UE, the media stream has been held by the remote UE and no media are received, then the UE is expected to render a communication held indication.

4.6 Interaction with other services

4.6.1 Communication Hold (HOLD)

Not applicable.

4.6.2 Terminating Identification Presentation (TIP)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.3 Terminating Identification Restriction (TIR)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.4 Originating Identification Presentation (OIP)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.5 Originating identification restriction (OIR)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.6 Conference calling (CONF)

If a participant of a conference invokes the HOLD service, it is not desirable to provide an announcement to the conference. If the AS supporting the HOLD supplementary service receives a re-INVITE (or UPDATE) request on a dialog for which the "isfocus" feature parameter was included in the Contact header from the remote end-point, the AS shall not initiate the procedures for the provision of an announcement to the held user(s).

4.6.7 Communication DIVersion services (CDIV)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.8 Malicious Communication IDentification (MCID)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.9 Anonymous Communication Rejection and Communication Barring (ACR/CB)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.10 Explicit Communication Transfer (ECT)

No impact, i.e. neither service shall affect the operation of the other service.

4.6.11 Enhanced Calling Name (eCNAM)

No impact. Neither service shall affect the operation of the other service.

4.6.12 Multi-Device (MuD)

No impact. Neither service shall affect the operation of the other service.

4.6.13 Multi-Identity (MiD)

No impact. Neither service shall affect the operation of the other service.

4.7 Interactions with other networks

4.7.1 Void

4.7.2 Void

4.7.3 Void

4.8 Parameter values (timers)

Not applicable.

Annex A (informative): Signalling Flows

A.1 HOLD communication

Assumption is that a session has been established between UE-A and UE-B using basic communication procedures according to 3GPP TS 24.229 [1], therefore the following signalling flows do not apply to the initial INVITE.

A.1.1 HOLD communication without announcement

The following diagram shows a communication session put on hold using a re-INVITE request . The same can be achieved by sending an UPDATE request.

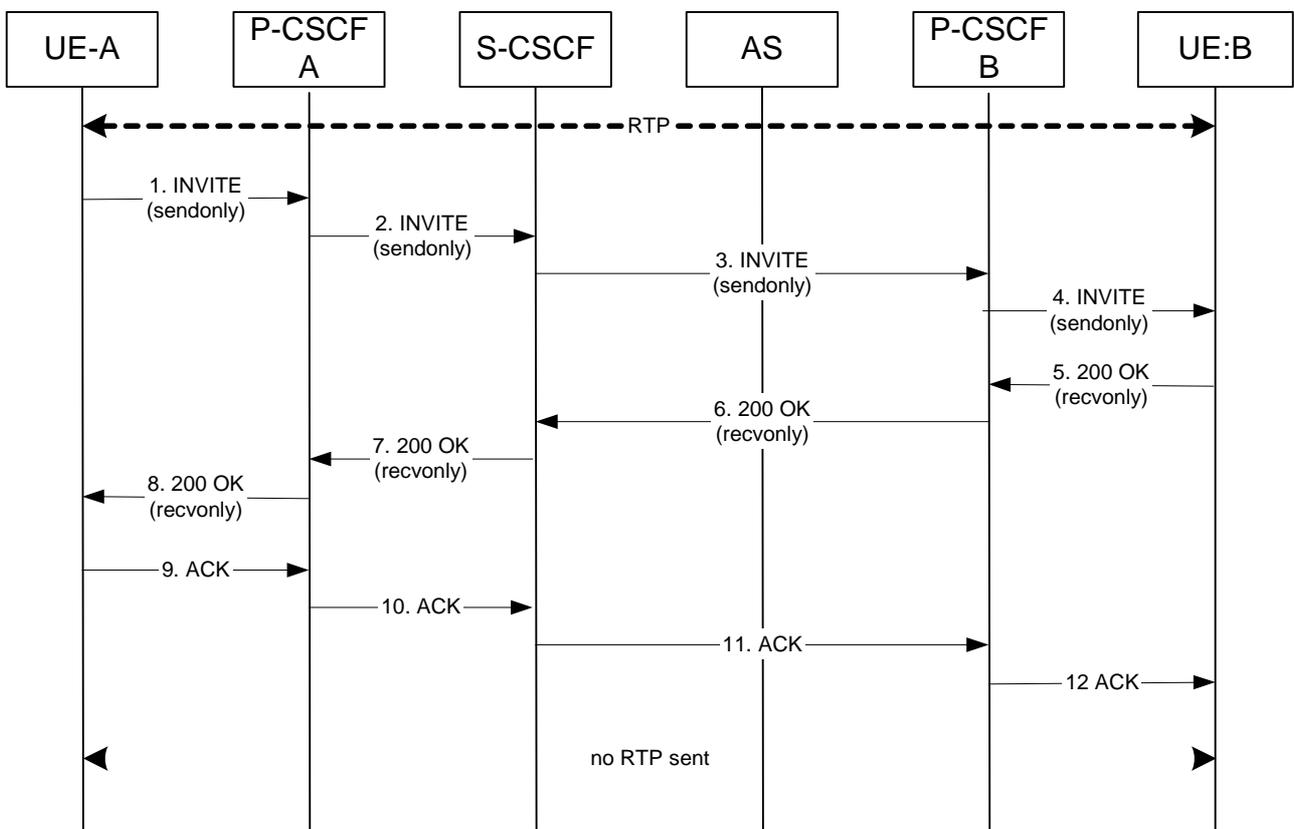


Figure A.1.1.1: HOLD communication without announcement to the held user

1. UE-A sends a re- INVITE to UE-B to hold the session - see example in table A.1.1.1-1. Hold is done by changing the SDP attribute. For each media stream that shall be held:
 - "a=sendonly", if the stream was previously a sendrecv media stream;
 - "a=inactive", if the stream was previously a recvonly media stream.

Table A.1.1.1-1: re-INVITE request (UE to P-CSCF)

```
INVITE user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74
;comp=sigcomp SIP/2.0
```

```
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.home1.net;lr>
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>; tag=171828
To: <tel:+1-212-555-2222>
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: sec-agree
Proxy-Require: sec-agree
Supported: precondition, 100rel, gruu, 199
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432; spi-s=87654321;
port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net; gr=urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6
;comp=sigcomp>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, SUBSCRIBE, NOTIFY
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:75
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendonly
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendonly
a=sendonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event
```

A.1.2 HOLD communication with announcement

The following diagram shows a communication session put on hold using a re-INVITE request with an announcement being played by the AS to the held party. The same can be achieved by sending an UPDATE request.

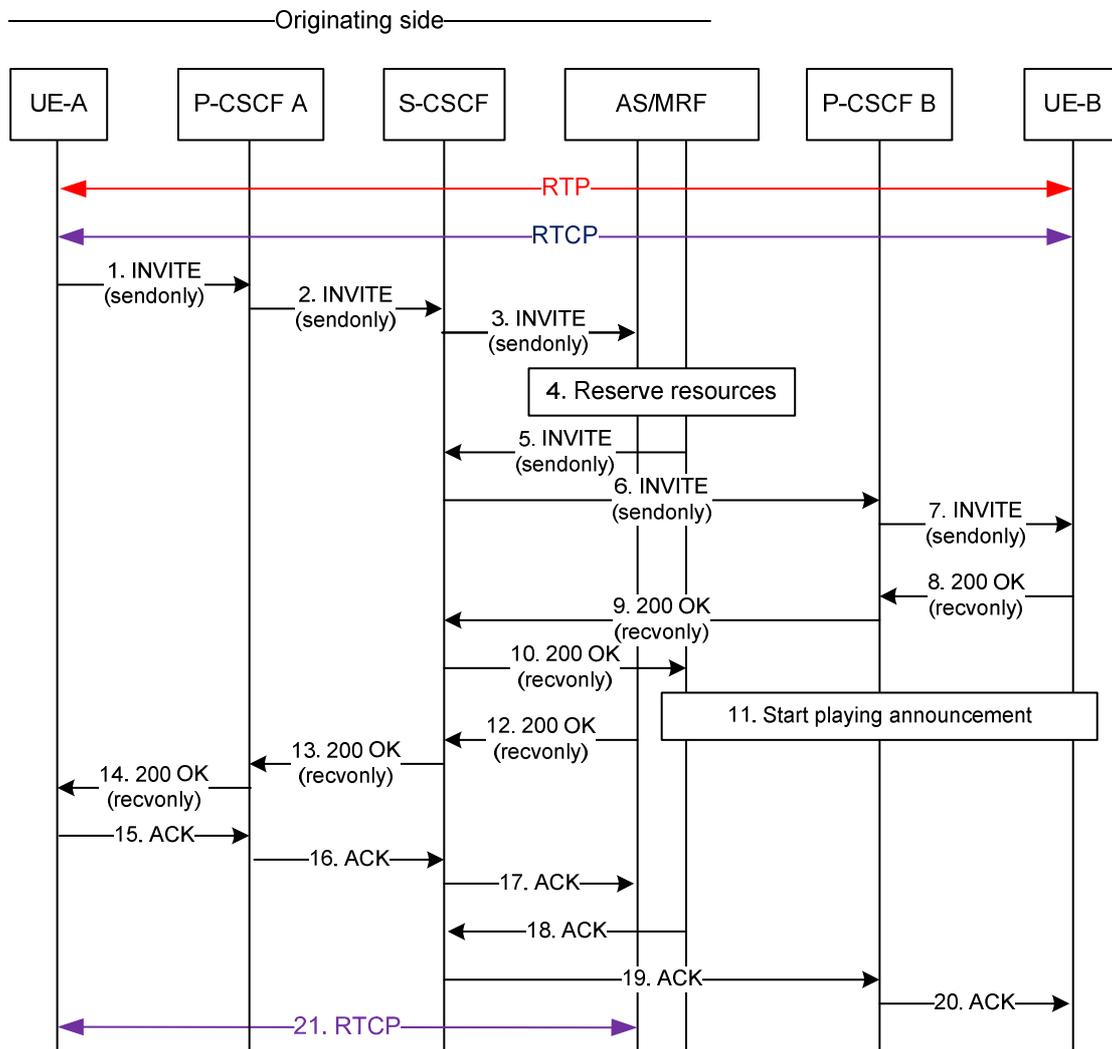


Figure A.1.2.1: HOLD communication with announcement to the held user

1. UE-A sends a SIP INVITE request to UE-B to hold the session - see example in table A.1.2.1-1. Hold is done by changing the SDP attribute. For each media stream that shall be held:
 - "a=sendonly", if the stream was previously a sendrecv media stream;

Table A.1.2.1-1: re-INVITE request (UE to P-CSCF)

```
INVITE user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74
;comp=sigcomp SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.home1.net;lr>
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>; tag=171828
To: <tel:+1-212-555-2222>
```

```

Call-ID: cb03a0s09a2sdfgklkj490333
Cseq: 127 INVITE
Require: sec-agree
Proxy-Require: sec-agree
Supported: precondition, 100rel, gruu, 199
Security-Verify: ipsec-3gpp; q=0.1; alg= hmac-sha-1-96; spi-c=98765432; spi-s=87654321;
port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net; gr=urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6
;comp=sigcomp>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, SUBSCRIBE, NOTIFY
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:75
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendonly
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event

```

2. P-CSCF A forwards the SIP INVITE request towards S-CSCF.
3. S-CSCF forwards the SIP INVITE request towards the AS/MRF.
4. AS/MRF decides to configure an announcement towards UE-B. It acts as a B2B UA, inserts MRFP in the media path and reserves resources. Each UA is represented by a separate vertical line in the figure.
5. AS/MRF sends a SIP INVITE request towards UE-B.
6. S-CSCF forwards the SIP INVITE request towards UE-B.
7. P-CSCF B forwards the SIP INVITE request to UE-B.
8. UE-B sends SIP 200 (OK) response towards AS/MRF.
9. P-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
10. S-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
11. AS/MRF starts playing announcement to UE-B, following the procedures in 3GPP TS 24.628 [6].
12. AS/MRF sends a SIP 200 (OK) response towards UE-A.
13. S-CSCF forwards the SIP 200 (OK) response towards UE-A.
14. P-CSCF A forwards the SIP 200 (OK) response towards UE-A.
15. UE-A sends a SIP ACK request towards AS/MRF.
16. P-CSCF forwards the SIP ACK request towards AS/MRF.
17. S-CSCF forwards the SIP ACK request towards AS/MRF.

- 18. AS/MRF sends a SIP ACK request towards UE-B.
- 19. S-CSCF forwards the SIP ACK request towards UE-B.
- 20. P-CSCF B forwards the SIP ACK request towards UE-B.
- 21. RTCP packets are exchanged between UE-A and AS/MRF. No RTP packets are sent/received by UE-A.

A.1.3 HOLD communication with modification of the SDP answer

The following diagram shows a communication session put on hold using a re-INVITE request with an announcement being played by the AS to the held party. The same can be achieved by sending an UPDATE request.

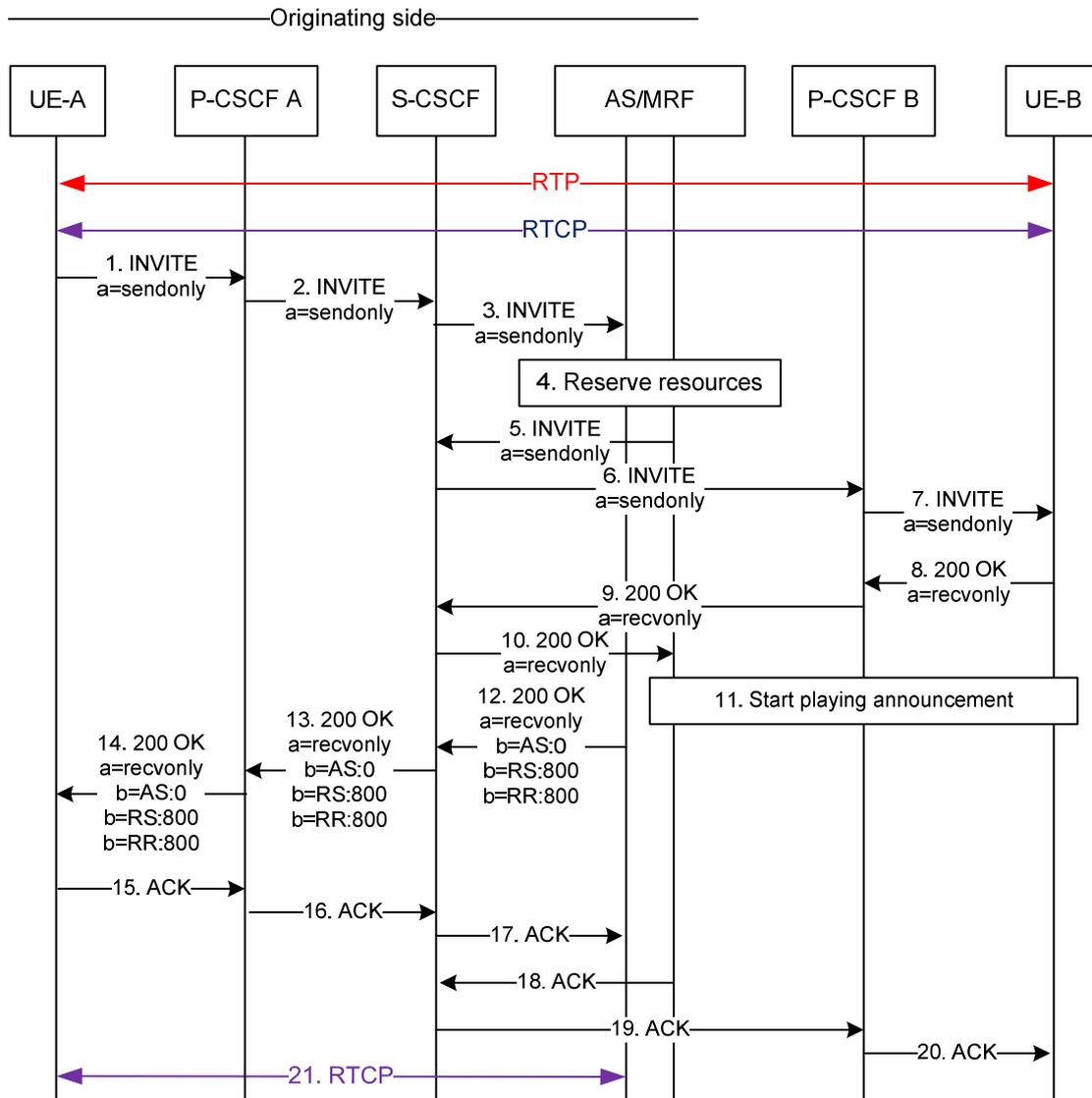


Figure A.1.3.1: HOLD communication with modification of the SDP answer

- 1. UE-A sends a SIP INVITE request to UE-B to hold the session by changing the direction attribute to "a=sendonly".

Table A.1.3-1: re-INVITE request (UE to P-CSCF)

```
INVITE user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74
;comp=sigcomp SIP/2.0
```

```

Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.homel.net;lr>
P-Preferred-Identity: "John Doe" <sip:user1_public1@homel.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@homel.net>; tag=171828
To: <tel:+1-212-555-2222>; tag=24615

Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: sec-agree
Proxy-Require: sec-agree
Supported: precondition, 100rel, gruu, 199
Security-Verify: ipsec-3gpp; q=0.1; alg= hmac-sha-1-96; spi-c=98765432; spi-s=87654321;
port-c=8642; port-s=7531
Contact: <sip:user1_public1@homel.net; gr=urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6
;comp=sigcomp>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, SUBSCRIBE, NOTIFY
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:75
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendonly
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event

```

2. P-CSCF A forwards the SIP INVITE request towards S-CSCF.
3. S-CSCF forwards the SIP INVITE request towards the AS/MRF.
4. AS/MRF decides to configure an announcement towards UE-B. It acts as a B2B UA, inserts MRFP in the media path and reserves resources. Each UA is represented by a separate vertical line in the figure.
5. AS/MRF sends a SIP INVITE request towards UE-B.
6. S-CSCF forwards the SIP INVITE request towards UE-B.
7. P-CSCF B forwards the SIP INVITE request to UE-B.
8. UE-B sends a SIP 200 (OK) response towards AS/MRF.
9. P-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
10. S-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
11. AS/MRF starts playing announcement to UE-B, following the procedures in 3GPP TS 24.628 [6].
12. The AS/MRF modifies the bandwidth attribute in the SIP 200 (OK) response.

Table A.1.3-2: 200 (OK) response (AS to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bk120f34.1
Via: SIP/2.0/UDP 1.2.3.4:1357;branch=z9hG4bKnashds7
From: <sip:user1_public1@home1.net>;tag=171828
To: <tel:+1-212-555-2222>; tag=24615
Contact: <sip:user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-
ad76cc7fc74>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Call-ID: cb03a0s09a2sdfg1kj490333
CSeq: 127 INVITE
Content-Length: (...)

v=0
o=- 2987933817 2987933817 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:0
b=RS:800
b=RR:2400
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=recvonly
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:0
b=RS:800
b=RR:800
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=recvonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event

```

13. S-CSCF forwards the SIP 200 (OK) response towards UE-A.
14. P-CSCF A forwards the SIP 200 (OK) response towards UE-A.
15. UE-A sends a SIP ACK request towards AS/MRF.
16. P-CSCF forwards the SIP ACK request towards AS/MRF.
17. S-CSCF forwards the SIP ACK request towards AS/MRF.
18. AS/MRF sends a SIP ACK request towards UE-B.
19. S-CSCF forwards the SIP ACK request towards UE-B.
20. P-CSCF B forwards the SIP ACK request towards UE-B.
21. RTCP packets are exchanged between UE-A and AS/MRF. No RTP packets are sent/received by UE-A.

A.2 RESUME Communication

A.2.1 RESUME communication without announcement

The following diagram shows how a communication session is resumed using a re-INVITE request; The same can be achieved by sending an UPDATE request.

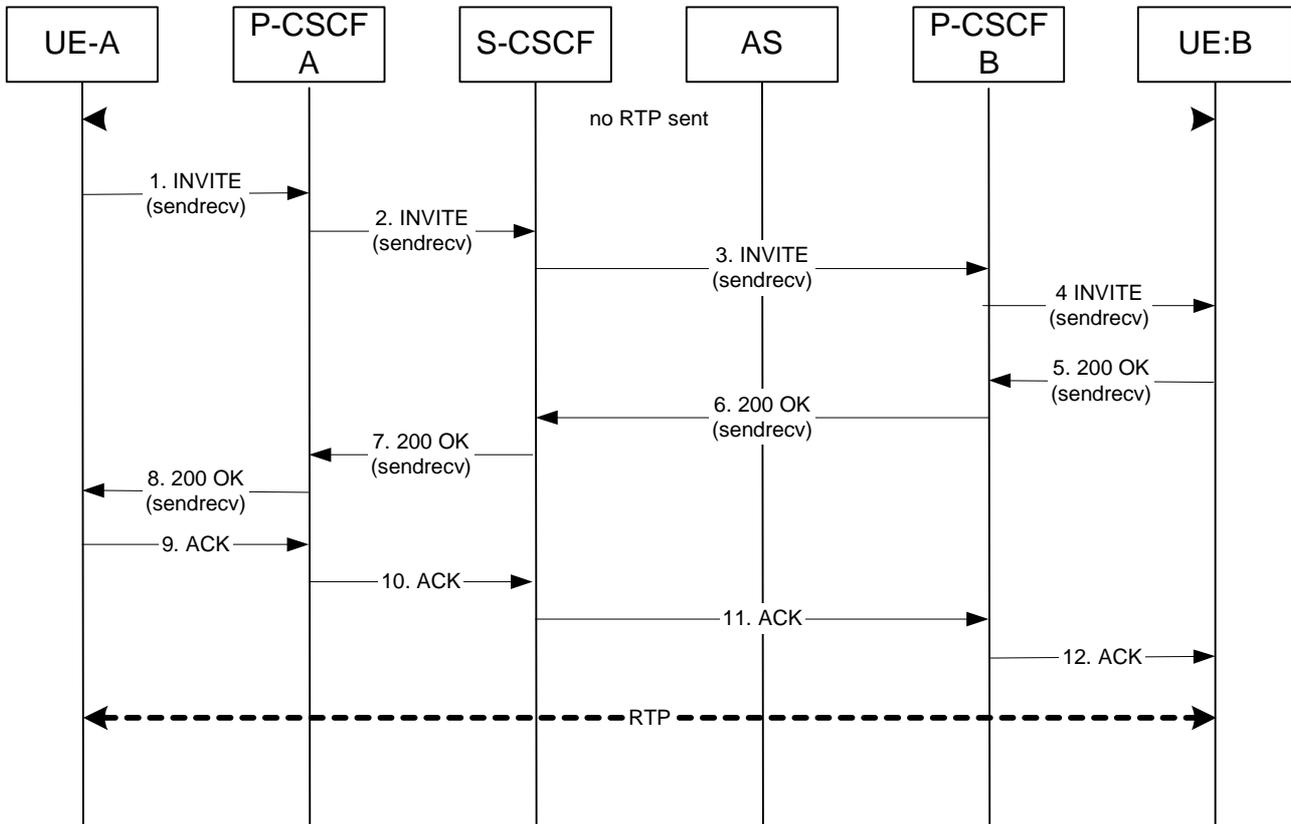


Figure A.2.1.1: RESUME communication without announcement to the held user

1. UE-A sends an INVITE to UE-B to resume the session - see example in table A.2.1.1-1. Resume is done by changing the SDP attribute. For each media stream that shall be resumed:
 - "a=sendrecv", if the stream was previously a sendonly media stream, or the attribute can be omitted, since sendrecv is the default;
 - "a=recvonly", if the stream was previously an inactive media stream.

Table A.2.1.1-1: re-INVITE request (UE to P-CSCF)

```

INVITE user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74
;comp=sigcomp SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.home1.net;lr>
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>; tag=171828
To: <tel:+1-212-555-2222>
    
```

```
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 127 INVITE
Require: sec-agree
Proxy-Require: sec-agree
Supported: precondition, 100rel, gruu, 199
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432; spi-s=87654321;
port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net; gr=urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6
;comp=sigcomp>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, SUBSCRIBE, NOTIFY
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:75
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendrecv
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendrecv
```

```

a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event
    
```

A.2.2 RESUME communication with announcement

The following diagram shows how a communication session is resumed using a re-INVITE request after it was held with an announcement being played by the AS to the held party. The same can be achieved by sending an UPDATE request.

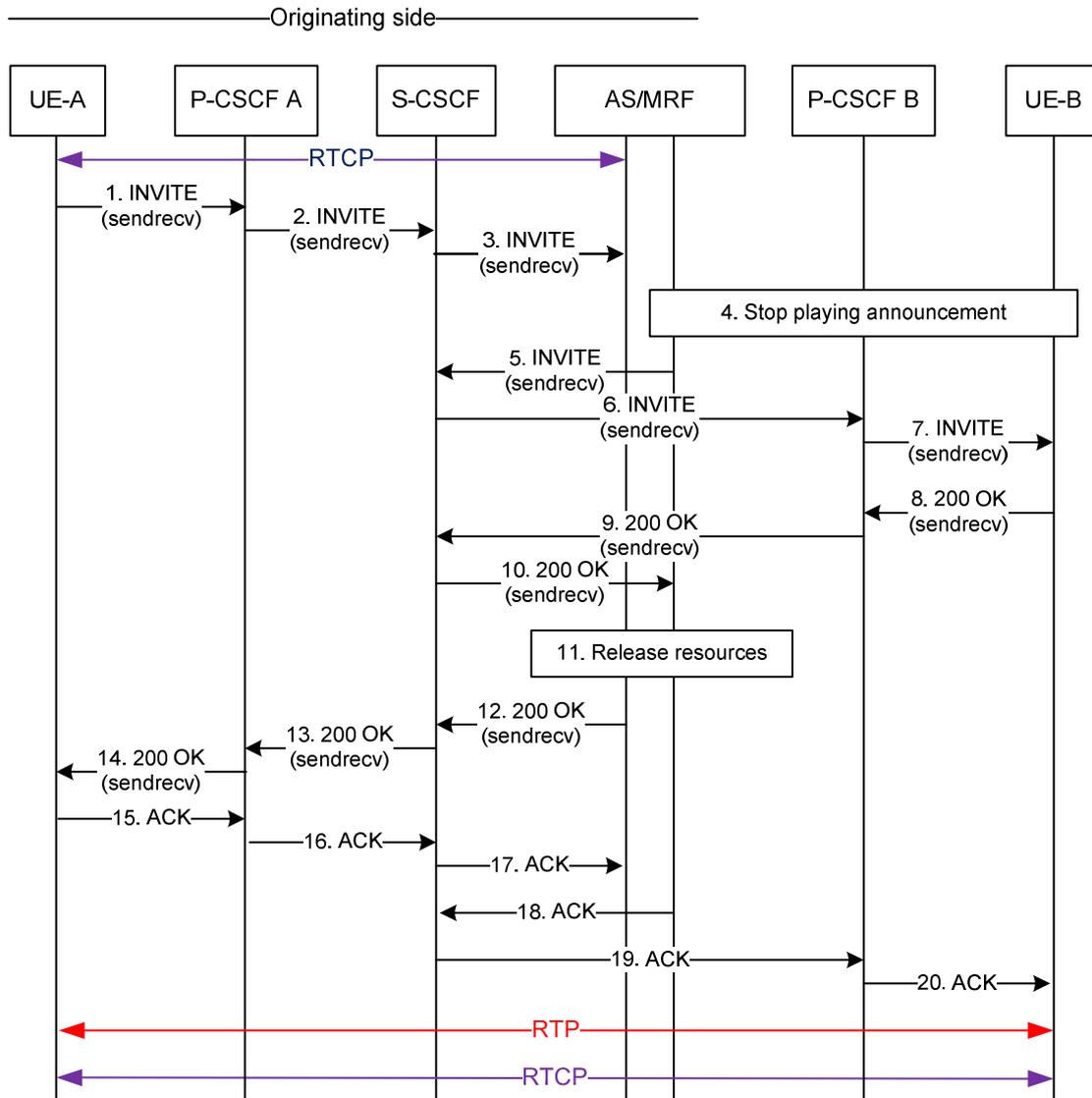


Figure A.2.2.1: RESUME communication with announcement to the held user

1. UE-A sends a SIP INVITE request to UE-B to resume the session - see example in table A.2.2.1-1. Resume is done by changing the SDP attribute. For each media stream that shall be resumed:
 - "a=sendrcv", if the stream was previously a sendonly media stream, or the attribute can be omitted, since sendrcv is the default;

Table A.2.2.1-1: re-INVITE request (UE to P-CSCF)

```

INVITE user2_public1@home2.net;gr=urn:uuid:2ad8950e-48a5-4a74-8d99-ad76cc7fc74
;comp=sigcomp SIP/2.0
    
```

```

Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]:1357;comp=sigcomp;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:pcscf1.visited1.net:7531;lr;comp=sigcomp>, <sip:orig@scscf1.home1.net;lr>
P-Preferred-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: <sip:user1_public1@home1.net>; tag=171828
To: <tel:+1-212-555-2222>
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: sec-agree
Proxy-Require: sec-agree
Supported: precondition, 100rel, gruu, 199
Security-Verify: ipsec-3gpp; q=0.1; alg=hmac-sha-1-96; spi-c=98765432; spi-s=87654321;
port-c=8642; port-s=7531
Contact: <sip:user1_public1@home1.net; gr=urn:uuid:f81d4fae-7dec-11d0-a765-00a0c91e6bf6
;comp=sigcomp>;+g.3gpp.icsi-ref="urn%3Aurn-7%3gpp-service.ims.icsi.mmtel"
Allow: INVITE, ACK, CANCEL, BYE, PRACK, UPDATE, REFER, MESSAGE, SUBSCRIBE, NOTIFY
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=0 0
m=video 3400 RTP/AVPF 98 99
b=AS:75
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendrecv
a=rtpmap:98 H263
a=fmtp:98 profile-level-id=0
a=rtpmap:99:MPVMP4V-ES
m=audio 3456 RTP/AVPF 97 96
b=AS:25.4
a=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos optional remote sendrecv
a=sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 telephone-event

```

2. P-CSCF A forwards the SIP INVITE request towards S-CSCF.
3. S-CSCF forwards the SIP INVITE request towards the AS/MRF.
4. AS/MRF stops playing announcement to UE-B, following the procedures in 3GPP TS 24.628 [6].
5. AS/MRF forwards the SIP INVITE request towards UE-B, resulting in the removal of MRFP from the media path.
6. S-CSCF forwards the SIP INVITE request towards UE-B.
7. P-CSCF B forwards the SIP INVITE request to UE-B.
8. UE-B sends a SIP 200 (OK) response towards AS/MRF.
9. P-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
10. S-CSCF forwards the SIP 200 (OK) response towards AS/MRF.
11. AS/MRF releases the resources allocated previously for the announcement.
12. AS/MRF forwards the SIP 200 (OK) response towards UE-A.
13. S-CSCF forwards the SIP 200 (OK) response towards UE-A.
14. P-CSCF A forwards the SIP 200 (OK) response towards UE-A.

15. UE-A sends SIP ACK request towards AS/MRF.
16. P-CSCF forwards the SIP ACK request towards AS/MRF.
17. S-CSCF forwards SIP ACK request towards AS/MRF.
18. AS/MRF forwards the SIP ACK request towards UE-B.
19. S-CSCF forwards the SIP ACK request towards UE-B.
20. P-CSCF B forwards the SIP ACK request towards UE-B.

Annex B (informative): Example of filter criteria

An example of an IFC Trigger Point configuration where the S-CSCF invokes the HOLD AS:

- Method="INVITE".

An example of an IFC Trigger Point configuration where the S-CSCF does not invoke the HOLD AS for a PSAP callback:

- Method="INVITE" and not Priority header field with a "psap-callback" header field value.

NOTE: Not invoking the HOLD AS assumes that the HOLD invocation request can be handled elsewhere in the network, e.g. in the PSAP itself.

Annex C (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2005-08					Publication as ETSI TS 183 010		1.1.1
2006-04					Publication as ETSI TS 183 010		1.2.1
2007-04					Publication as ETSI TS 183 010		1.2.2
2007-12					Conversion to 3GPP TS 24.410		1.2.3
2008-01					Technically identical copy as 3GPP TS 24.610 as basis for further development.		1.2.4
2008-02					Implemented C1-080101		1.3.0
2008-04					Implemented C1-080886, C1-080887, C1-081090, C1-081091, C1-081113		1.4.0
2008-05					Implemented C1-081831, C1-081913		1.5.0
2008-05					Editorial changes done by MCC	1.5.0	1.5.1
2008-06	CT#40	CP-080330			CP-080330 was approved by CT#40 and version 8.0.0 is created by MCC for publishing	1.5.1	8.0.0
2008-09	CT#41	CP-080533	0001		Correction of Activation/deactivation of HOLD	8.0.0	8.1.0
2008-09	CT#41	CP-080533	0002	1	Miscellaneous clean-up corrections	8.0.0	8.1.0
2008-09	CT#41	CP-080533	0003		Applicability statement in scope	8.0.0	8.1.0
2008-09	CT#41	CP-080533	0004		Interaction of HOLD and CONF	8.0.0	8.1.0
2008-12	CT#42	CP-080865	0005	1	Holding or resuming all media streams	8.1.0	8.2.0
2008-12	CT#42	CP-080865	0006	2	Contents of SDP offer in HOLD	8.1.0	8.2.0
2008-12	CT#42	CP-080865	0007	1	Fixed the flows	8.1.0	8.2.0
2009-03	CT#43	CP-090121	0008		Correction of URN-value for Service Identifiers	8.2.0	8.3.0
2009-12	CT#46	CP-090923	0009	1	Correction of icsi-ref feature tag	8.3.0	9.0.0
2010-09	CT#49	CP-100526	0014		HOLD corrections	9.0.0	9.1.0
2011-03	CT#51				Upgrade to Rel-10	9.1.0	10.0.0
2012-03	CT#55	CP-120124	0015	1	HOLD-CONF interaction	10.0.0	11.0.0
2012-03	CT#55	CP-120197	0016	2	Clarification of HOLD procedures	10.0.0	11.0.0
2012-06	CT#56	CP-120307	0017	1	Usage of SDP direction attributes correction	11.0.0	11.1.0
2012-12	CT#58	CP-120778	0021	2	Emergency call HOLD suppression	11.1.0	11.2.0
2013-06	CT#60	CP-130414	0022	8	Prevent HOLD for PSAP callback	11.2.0	12.0.0
2013-09	CT#61	CP-130485	0027	2	Call Hold Bandwidth Management	12.0.0	12.1.0
2013-09	CT#61	CP-130507	0028		draft-ietf-ecrit-psap-callback reference update	12.0.0	12.1.0
2013-12	CT#62	CP-130758	0029	2	Reference update: draft-ietf-ecrit-psap-callback	12.1.0	12.2.0
2013-12	CT#62	CP-130763	0030	1	RTCP flow during hold with announcement	12.1.0	12.2.0
2014-03	CT#63	CP-140143	0032		Correction the direction attribute of media stream(s) in the Communication Hold supplementary service	12.2.0	12.3.0
2014-06	CT#64	CP-140330	0034		Clean-up of HOLD flows	12.3.0	12.4.0
2014-06	CT#64	CP-140330	0036		Minor corrections 24.610	12.3.0	12.4.0
2014-09	CT#65	CP-140665	0033	4	Media directionality when resuming a session established with one-way media	12.4.0	12.5.0
2014-12	CT#66	CP-140833	0037	1	Reference update: RFC 7090 (draft-ietf-ecrit-psap-callback)	12.5.0	12.6.0
2015-06	CT#67	CP-150322	0039	1	Media sharing and HOLD service	12.6.0	13.0.0
2015-12	CT#70	CP-150709	0042	1	Local held indication at UE	13.0.0	13.1.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-03	CT-75					Upgrade to Rel-14	14.0.0
2017-12	CT-78	CP-173071	0043	2	B	Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem	15.0.0
2018-03	CT-79	CP-180090	0044	4	F	Clarification of condition for providing announcement to the held UE	15.1.0
2019-12	CT-86	CP-193111	0045		B	Adding interactions with "Multi-Device" and "Multi-Identity" services	16.0.0
2022-04	CT-95e	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0

History

Document history		
V18.0.0	May 2024	Publication