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Technical Specification

**Telecommunications and Internet converged
Services and Protocols for Advanced Networking (TISPAN);
Common Basic Communication procedures;
Protocol specification**

ETSI

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document describes the stage three protocol for basic communication procedures common to several services when at least one Application Server (AS) is included in the communication. The common procedures are based on stage three specifications for services.

The present document contains examples of signalling flows for the common basic communication procedures.

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 and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version 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.

[1] ETSI ES 283 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3".

[2] IETF RFC 2234: "Augmented BNF for Syntax Specifications: ABNF".

[3] ETSI TS 182 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Stage 2 description (3GPP TS 23.228 v7.2.0, modified)".

[4] IETF RFC 3261: "SIP: Session Initiation Protocol".

[5] IETF RFC 3262: "Reliability of Provisional Responses in the Session Initiation Protocol (SIP)".

[6] IETF RFC 3960: "Early Media and Ringing Tone Generation in the Session Initiation Protocol (SIP)".

[7] ETSI TS 181 005: "TISPAN NGN Service and Capabilities Requirements; Release 1".

[8] ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-system (RACS); Functional Architecture".

[9] ETSI ES 283 027: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN). Endorsement of the SIP-ISUP Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks".

[10] IETF RFC 4566: "SDP: Session Description Protocol".

[11] ITU-T Recommendation I.112: "Vocabulary of terms for ISDNs".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in TR 180 000 and the following apply:

announcement: service related message sent to a user that can be of any type of media e.g. a voice message or a video-clip

communication: transfer of information between two or more users, entities, processes or nodes according to some agreed conventions

> NOTE: See ITU-T Recommendation I.112 modified [11].

early media: media sent before a communication is established

in-band announcement: announcement sent by the network using the bearer established for a communication

Incoming Media Gateway Control Function: MGCF that terminates incoming calls from IMS and originates call the BICC/ISUP protocols

Originating Application Server (O-AS): controlling application server responsible for the services provided to the originating user

Outgoing Media Gateway Control Function (O-MGCF): MGCF that terminates incoming calls using BICC/ISUP protocols and originates calls to IMS

Terminating Application Server (T-AS): controlling application server responsible for the services provided to the terminating user

3.2   Abbreviations

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

ACR	Automatic Call Rejection
AS	Application Server
B2BUA	Back-to-Back User Agent
IBCF	Interconnection Border Control Function
DTMF	Dual-Tone Multi-Frequency
I-CSCF	Interrogating Call Session Control Function
IFC	Initial Filter Criteria
I-MGCF	Incoming Media Gateway Control Function
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MGCF	Media Gateway Control Function
MGW	Media GateWay
MRFC	Media Resource Function Controller
MRFP	Media Resource Function Processors
NDUB	Network Determined User Busy
NGN	Next Generation Network
O-AS	Originating Application Server
O-MGCF	Outgoing Media Gateway Control Function
P-CSCF	Proxy Call Session Control Function
PSTN	Public Switched Telephone Network
S-CSCF	Serving Call Session Control Function
SDP	Session Description Protocol
SIP	Session Initiation Protocol
T-AS	Terminating Application Server
T-MGF	Trunking Media Gateway Function
UAC	User Agent Client
UAS	User Agent Server

UDUB	User Determined User Busy
UE	User Equipment
URL	Uniform Resource Locator

4 Common basic communication procedures

4.1 Introduction

Services may need to send announcements for example to explain the reason for rejecting a communication request or to report the progress of a communication request. The announcement may be of any type of media e.g. an audio announcement or a video clip. Clause 4.2 describes the announcement common procedure and annex A shows examples of signalling flows for some announcement scenarios.

Some services are triggered by a user's busy condition e.g. the Communication Forwarding on Busy service. The busy condition may be determined by the network i.e. the Network Determine User Busy (NDUB) condition or by the user i.e. the User Determine User Busy (UDUB) condition. Clause 4.3 describes the network determine user busy common procedure and the annex B shows examples of signalling flows for some busy scenarios.

4.2 Announcement

4.2.1 General

Announcements may be sent during the establishment of a communication session, when rejecting a communication request or during an established communication session.

4.2.2 Providing announcements to a user during the establishment of a communication session

A service may provide an announcement during the establishment of a communication. If an announcement is provided the service shall use one of the following methods:

- use an Call-Info header field in the INVITE request; or

- use an Call-Info header field in the 180 (Ringing) response to the INVITE request; or

- use early media as defined by RFC 3960 [6].

4.2.3 Providing announcements to a user during an established communication session

A service may provide an announcement during an established communication. If an announcement is provided the service shall use one of the following methods:

- use an Call-Info header field in a re-INVITE request; or

- use the existing media stream. The media stream may have to be re-negotiated by the service to a media type suitable for the announcement.

Mixing announcements into an existing media stream requires that the AS use the 3rd party call control procedure as specified by clause 5.7.5 in ES 283 003 [1].

4.2.4   Communication request rejected by AS

A service may provide an announcement when rejecting a communication request e.g. in order to explain the reason for rejecting the communication request in more detail. If an announcement is provided the service shall:

- use an Error-Info header field in the 3xx, 4xx, 5xx or 6xx response to the INVITE request; or

- use early media for sending the announcement in-band as defined by RFC 3960 [6]; or

- accept the communication request and use the established session for sending an in-band announcement.

4.3   Alternative ring tone

A service may provide an alternative ring tone using the Alert-Info header field as specified by RFC 3261 [4].

The intention with this alternative ring tone is to override local ring tones provided by the UE. It is recommended that the size of the referenced alternative ring tone is small in order not to delay communication establishment.

4.4   Network Determined User Busy (NDUB)

Deployment of some service may require the support of the optional service requirements for "network determined user busy" and "approaching network determined user busy" defined in TS 101 025 [7]. In order to support such requirements it is assumed that a network function / application server is deployed to track a user's busy condition status from the perspective of the network.

The present document is applicable only in cases whereby the network operator has complete knowledge of the applications to which an end user has subscribed and assumes that those applications will furnish the network entity responsible for tracking "busy condition" with appropriate information to enable this determination to be made. This may require appropriate business arrangements between the network operator and the application provider.

NOTE: In the context of NGN release 1 there is no scope for tracking bandwidth availability in the customer network (see ES 282 003 [8]). As such it is possible that a communication could be presented based on the network entity determining that the communication can be presented when in fact congestion in the customer network will prevent the communication being presented. This is a limitation of the present document in release 1.

Determination of "network determined user busy" by the network may restrict the ability to deploy and support end user devices which perform local services based on "user determined user busy" as part of their base functionality.

4.5   Operational requirements

4.5.1   Provision/withdrawn

No special requirements for provision/withdrawn. Any requirements on provision/withdrawn belong to the service using the common basic procedures specified by the present document.

4.5.2   Requirements on the originating network side

The capability for early media is described in annex C.

4.5.3   Requirements on the terminating network side

4.6   The capability for early media is described in clause C.2.3

The syntax for the relevant headers in the SIP requests and SIP responses shall be as follows:

- The syntax of the Alert-Info header field conforms to the requirements in ES 283 003 [1] and RFC 3261 [4].

- The syntax of the Error-Info header field conforms to the requirements in ES 283 003 [1] and RFC 3261 [4].

- The syntax of the Call-Info header field conforms to the requirements in ES 283 003 [1] and RFC 3261 [4].

4.7   Signalling procedures

4.7.1   Activation, deactivation and registration

There are no procedures for activation, deactivation or registration defined.

4.7.2   Invocation and operation

4.7.2.1   Actions at the originating UE

Procedures according to ES 283 003 [1] shall apply.

Certain services require the usage of the Alert-Info header field, Call-Info header field and Error-Info header field according to procedures specified by RFC 3261 [4].

If the UE detects that in-band information is received from the network as early media, the in-band information received from the network shall override locally generated communication progress information.

4.7.2.2   Actions at the originating P-CSCF

Procedures according to ES 283 003 [1] shall apply.

The P-CSCF may have a local policy to remove an Error-Info header field, Call-Info header field and/or an Alert-Info header field.

The P-CSCF shall authorize early media as specified in annex C.

4.7.2.3   Actions at the S-CSCF serving the originating user

Procedures according to ES 283 003 [1] shall apply.

4.7.2.4   Actions at the incoming I-CSCF

Procedures according to ES 283 003 [1] shall apply.

4.7.2.5   Actions at the outgoing IBCF

Procedures according to ES 283 003 [1] shall apply.

The IBCF may have a local policy to remove an Error-Info header field, Call-Info header field and/or an Alert-Info header field.

The IBCF shall authorize early media as specified in annex C.

4.7.2.6   Actions at the incoming IBCF

Procedures according to ES 283 003 [1] shall apply.

The IBCF may have a local policy to remove an Error-Info header field, Call-Info header field and/or an Alert-Info header field.

The IBCF shall authorize early media as specified in annex C.

4.7.2.7   Actions at the destination P-CSCF

Procedures according to ES 283 003 [1] shall apply.

The P-CSCF may have a local policy to remove an Error-Info header field, Call-Info header field and/or an Alert-Info header field.

The P-CSCF shall authorize early media as specified in annex C.

4.7.2.8   Actions at the S-CSCF serving the terminating UE

Procedures according to ES 283 003 [1] shall apply.

4.7.2.9   Actions at the AS

The procedures in this clause apply for the AS serving the originating UE and the AS serving the terminating UE.

4.7.2.9.1   Providing announcements during an established communication session

Services may use the Call-Info header field according to procedures specified by RFC 3261 [4] to provide an announcement during an established communication session.

Services may send an in-band message or media using an existing media-stream to provide an announcement during an established communication session.

4.7.2.9.2   Providing announcements during the establishment of an communication session

The AS may use the Call-Info header field according to procedures specified by RFC 3261 [4] in order to provide an announcement or an alternative ring tone as specified in clause 4.7.2.10.4 during the establishment of a communication session.

The AS may use the MRFC and the MRFP to send an in-band announcement using early media according to the rules and procedures of the RFC 3261 [4], RFC 3262 [5] and RFC 3960 [6].

4.7.2.9.3   Providing announcements when communication request is rejected by the AS

The AS may use the Error-Info header field according to procedures specified by RFC 3261 [4] in order to provide an announcement when the establishment of a communication session is rejected.

The AS may use the MRFC and MRFP to send an in-band announcement using early media according to the rules and procedures of the RFC 3261 [4], RFC 3262 [5] and RFC 3960 [6].

4.7.2.9.4   Providing alternative ring tone during the establishment of a communication session

The AS may use the Alert-Info header field according to procedures specified by RFC 3261 [4] in order to provide an alternative ring tone during the establishment of a communication session.

4.7.2.9.5   Early dialog procedures at the AS

The procedures for dealing with early dialog established between the AS and the originating UE is described in annex E.

4.7.2.10   Action at the terminating UE

Certain services require the usage of the Alert-Info header field and Call-Info header field according to procedures specified by RFC 3261 [4].

4.8   Interactions with other networks

4.8.1   Interaction with PSTN/ISDN

When a 180 (Ringing) response is received containing an Alert-Info header field the O-MGCF can instruct the T-MGF to play out early media available at the associated URL, to the PSTN leg of the communication. The interaction with PSTN/ISDN is described in ES 283 027 [9].

When a 3xx, 4xx, 5xx or 6xx SIP response to an INVITE request is received from the network containing an Error-Info header field, the O-MGCF can instruct the T-MGF to play out media available at the associated URL, towards PSTN.

When a reINVITE request is received from the network containing a Call-Info header field the MGCF can instruct the MGW to transport media available at the associated URL, to the PSTN leg of the communication.

An I-MGCF may as a network option generate a Call-Info header field, an Alert-Info header field or an Error-Info header field according to rules and procedures of RFC 3261 [4] to provide media instead of the in-band media received from the PSTN.

When a 183 (Session Progress) response is received the O-MGCF sends an appropriate message towards the PSTN/ISDN including an indication that in-band information is available. The interaction with PSTN/ISDN is described in ES 283 027 [9].

The O-MGCF authorizes early media as specified in annex C. If early media is authorized the O-MGCF indicates that in-band information is available towards the PSTN/ISDN. The interaction with PSTN/ISDN is described in ES 283 027 [9].

The I-MGCF can include a P-Early-Media header field when in-band information is received from the PSTN/ISDN as specified in the annex C.

4.8.2   Interworking with PSTN/ISDN Emulation

When a 180 (Ringing) response is received containing an Alert-Info header field the O-MGCF can instruct the T-MGF to play out early media available at the associated URL, to the PSTN/ISDN Emulation leg of the communication.

When a 3xx, 4xx, 5xx or 6xx SIP response to an INVITE request is received from the network containing an Error-Info header field, the O-MGCF can instruct the T-MGF to play out media available at the associated URL, to the PSTN/ISDN Emulation side of the communication.

When a re INVITE request is received from the network containing a Call-Info header field the PSTN/ISDN Emulation Subsystem can instruct the T-MGF to transport media available at the associated URL, to the PSTN/ISDN Emulation leg of the communication.

A PSTN/ISDN Emulation subsystem may as a network option generate a Call-Info header field, an Alert-Info header field or an Error-Info header field according to rules and procedures of RFC 3261 [4] to provide media instead of the in-band media received from the PSTN/ISDN Emulation subsystem.

The PSTN/ISDN Emulation subsystem authorizes early media as specified in annex C.

The PSTN/ISDN Emulation subsystem can include a P-Early-Media header field when in-band information is received from the PSTN/ISDN as specified in the annex C.

4.8.3   Interaction with external IP network

Depending on the external IP network and message direction, IBCF may have a local policy to remove an Error-Info header field, Call-Info header field and/or an Alert-Info header field.

4.9   Signalling flows

Signalling flows are documented in annexes A and B.

4.10   Parameter values (timers)

No specific timers are needed.

Annex A (informative):
Signalling flows for announcements

This annex shows some example signalling flows for the procedures described in the clause 4.1.

A.1   Providing announcements to a user during the establishment of a communication session

A.1.1   Providing in-band announcement

This clause shows an example signalling flow of how an AS can send an announcement to the calling user during the establishment of a communication.

Separate dialogs are established between the origination UE and the AS controlling the announcement, and the originating UE and the terminating UE. It is allowed that a different SDP answer is sent in the 200 (OK) response from the terminating UE than the SDP answer that was previously sent from the AS in the 183 (Session progress) response.

The AS can e.g. be the AS serving the calling party or the AS serving a called party and may apply for example when a communication is going to be diverted and the AS serving the diverting user inform the calling party that the communication is going to be diverted.

Figure A.1 shows the signalling flow for the scenario:
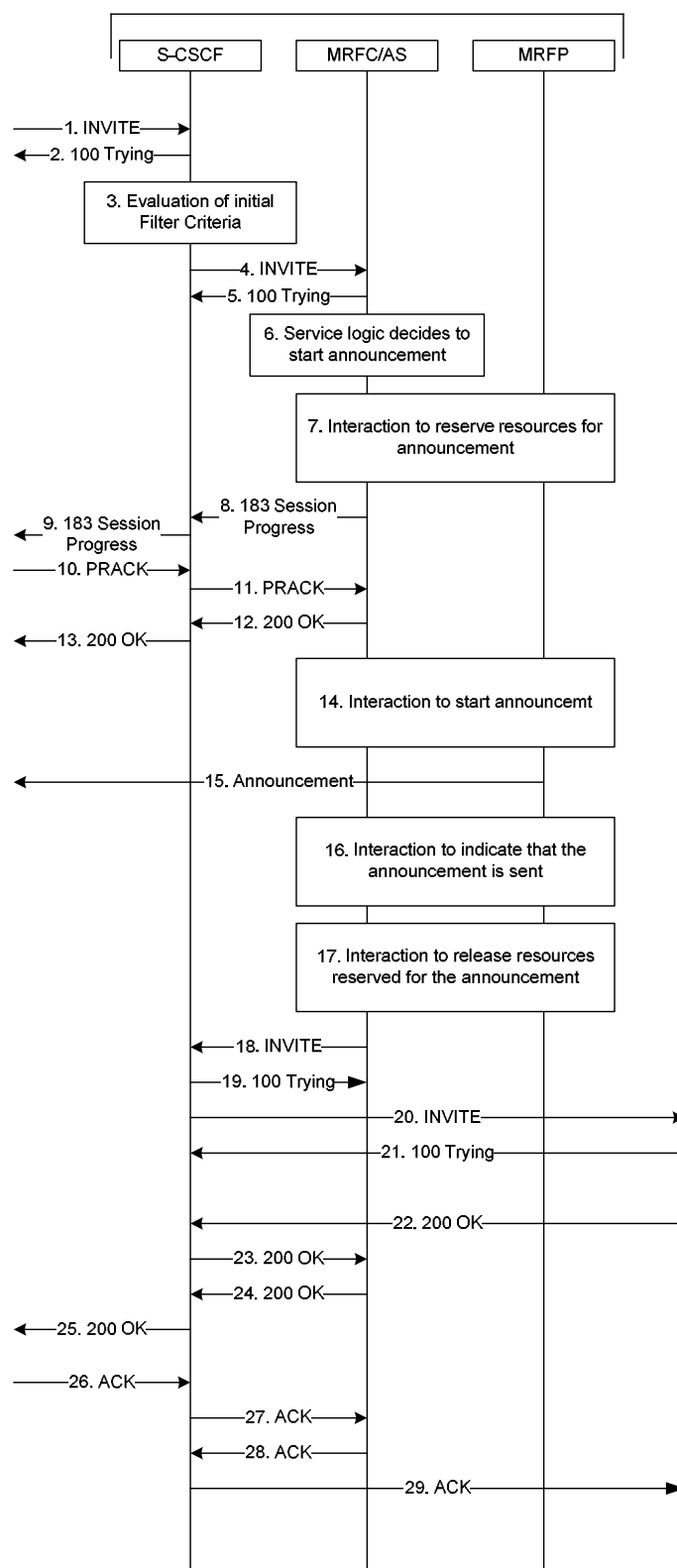
NOTE: The called party may return provisional responses to the INVITE request. However, for simplicity those responses are left out.

Figure A.1: Announcement started during the establishment of a communication

The calling party initiates a communication by means of an INVITE request. The INVITE request is forwarded toward the called party.

Along the signalling path, created by the INVITE request, some service logic in an Application Server (AS) wants to send an announcement towards the calling party.

The flow is based on the assumptions that the Supported header field includes the option-tag "100rel".

The steps of the signalling flow are as follows:

1) S-CSCF receives an INVITE request.

2) S-CSCF sends the 100 (Trying) response towards to sender of the INVITE request.

3) S-CSCF evaluates the initial Filter Criteria.

4) S-CSCF sends the INVITE request to the AS.

5) The AS sends the 100 (Trying) to S-CSCF.

6) Service logic in the AS decides to send an announcement to the calling party.

7) The MRFC interacts with the MRFP in order to reserve resources for the announcement. As part of the interaction with MRFP the AS receives the necessary media parameters e.g. IP address and port numbers and provide the IP address and port number for the calling party to the MRFP.

8) The AS sends a 183 (Session progress) response to S-CSCF.
   The response includes:

a) an answer to the SDP received in the INVITE request;

b) a P-Early-Media header field set to "sendonly"; and

c) the Require header field set to "100rel".

9) S-CSCF sends the 183 (Session progress) response towards the calling party.

10) S-CSCF receives a PRACK request.

11) S-CSCF sends the PRACK request to the AS.

12) The AS sends a 200 (OK) to the PRACK request to S-CSCF.

13) S-CSCF sends the 200 (OK) towards the calling party.

14) The MRFC interacts with the MRFP in order to start the announcement.

15) The MRFP sends the announcement towards the calling party.

16) The complete announcement is sent and the MRFP interacts with the AS/MRFC in order to inform that the announcement is terminated.

17) The MRFC interacts with the MRFP in order to release the resources used for the announcement.

18) The AS sends the INVTE request towards the called party. The INVITE request contains the same information as the INVITE request received in step 4 with the modification done by AS according to rules and procedures of DES TISPAN-ES 283 003 [1].

19) S-CSCF sends the 100 (Trying) response to the AS.

20) S-CSCF sends the INVITE request towards the called party.

21) S-CSCF receives a 100 (Trying) response.

22) S-CSCF receives a 200 (OK) response to the INVITE request.

23) S-CSCF sends the 200 (OK) response to the INVITE request to the AS.

24) The AS sends the 200 (OK) response to the INVITE request to the S-CSCF.

25) S-CSCF sends the 200 (OK) response to the INVITE request towards the calling party.

26) S-CSCF receives an ACK request.

27) S-CSCF sends the ACK request to the AS.

28) The AS sends the ACK request to S-CSCF.

29) S-CSCF sends the ACK towards the called party.

When the UE of the calling party receives the 200 (OK) response to the INVITE request the UE can regard the early dialog created for the announcement between the UE and the AS terminated.

A.1.2   Including Alert-Info header field in the 180 (Ringing) response

RFC 3261 [4] specifies the Alert-Info header field as a means to indicate a source of media to play an alternative ring tone by an originating endpoint.

An example of this mechanism is shown in figure A.2.
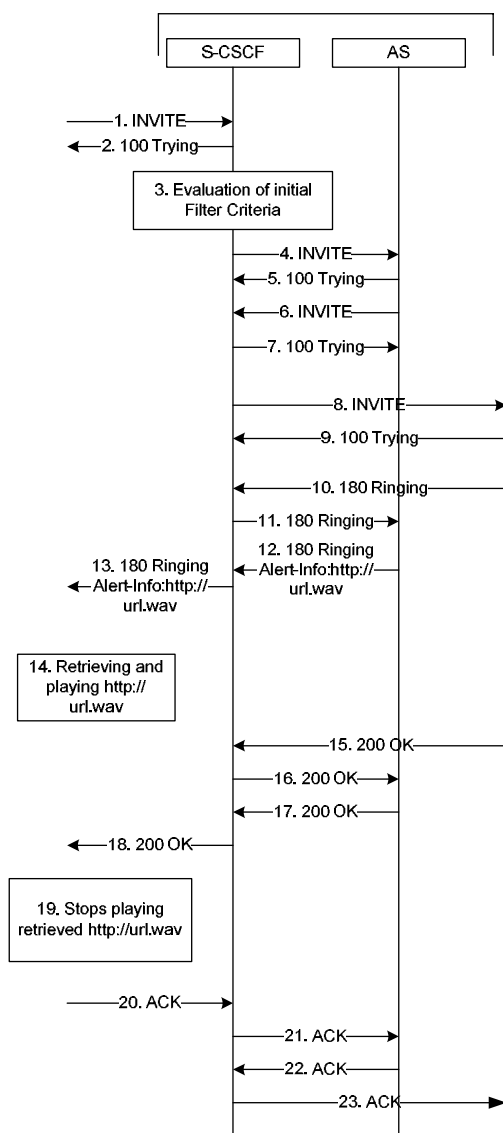
NOTE: In the figure the SDP signalling details to establish media are not shown for simplicity.

Figure A.2: Alert-Info header field in the 180 (Ringing) response to indicate an alternative ring tone

The steps of the flow are as follows:

1) S-CSCF receives an INVITE request from the originating user. The originating user may be a user served by this S-CSCF, a user served by another S-CSCF or a user connected to PSTN/ISDN via a MGCF.

2) S-CSCF sends a 100 (Trying) response.

3) S-CSCF evaluates the Initial Filter Criteria.

4) S-CSCF sends the INVITE request to the AS.

5) The AS sends a 100 (Trying) response to S-CSCF.

6) The AS sends the INVITE request to S-CSCF.

7) S-CSCF sends the 100 (Trying) response to the AS.

8) S-CSCF sends the INVITE request towards the called party. The called party may be a user served by another S-CSCF or a user connected to PSTN/ISDN via a MGCF.

9) S-CSCF receives a 100 (Trying) response.

10) S-CSCF receives a 180 (Ringing) response.

11) S-CSCF sends the 180 (Ringing) response to the AS.

12) The AS inserts a valid Alert-Info header field in the 180 (Ringing) including a URL to a media file containing the appropriate tone and sends the 180 (Ringing) response to S-CSCF.

EXAMPLE: this file http://operator.net/tone.wav, in the picture abbreviated to http://url.wav is played at the originating UE (step 14).

13) S-CSCF sends the 180 (Ringing) response towards the originating user.

14) The http://url.wav (for example http://operator.net/tone.wav) is retrieved and played at the originating user.

15-18) S-CSCF receives a 200 (OK) response to the INVITE request and forward it to the originating user via the AS.

19) The originating user stops playing the tone.

20-23) S-CSCF receives an ACK request and forwards it towards the called party via the AS.

A.1.3   Announcements provided by the PSTN/ISDN

This clause shows the signalling flow for a scenario where a user connected to the IP network establish a communication with a user connected to the PSTN/ISDN. During the establishment of the communication the PSTN/ISDN provides an announcement e.g. "The communication is forwarded" or "The user is not reachable".

Figure A.3 shows the signalling flow for the scenario:
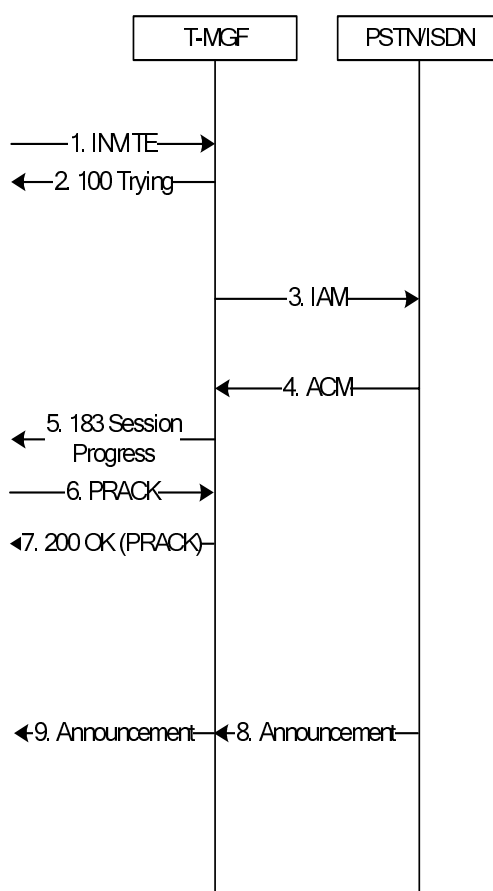
NOTE: The flow assumes the use of the option-tag "100rel" defined in RFC 3262 [5] other scenarios may also
           apply.

Figure A.3: Announcement provided by PSTN/ISDN during the establishment of a communication

The steps of the flow are as follows:

1)   The MGCF receives an INVITE request from the IP network. The request includes an SDP offer.

2)   The MGCF sends a 100 (Trying) response to the IP network.

3)   The T-MGF sends an IAM towards PSTN.

4)   The MGCF receives an early ACM from the PSTN/ISDN with an indication that "In-band information may be
      available".

5)   The MGCF sends a 183 (Session Progress) response to the IP network.

The response includes:

a)   the answer to the SDP offer received in the INVITE request;

b)   A P-Early-Media header field set to "sendonly"; and

c)   The option-tag "100rel" in the Require header.

6)   The MGCF receives the PRACK request.

7)   The MGCF sends a 200 (OK) response to the PRACK request.

8-9) The MGCF sends the in-band announcement received from the PSTN/ISDN to the IP network.

Depending on the reason for the announcement the establishment of the communication continues or the establishment of the communication is aborted.

A.1.4   Announcement provided towards a user connected to the PSTN/ISDN

This clause shows an example signalling flow for a scenario where a user in PSTN/ISDN establish a communication with a user connected to IMS. During the establishment an AS in the IP network provides an announcement, e.g. "The communication is forwarded" or "The user is not reachable".

Figure A.4 shows the signalling flow for the scenario.
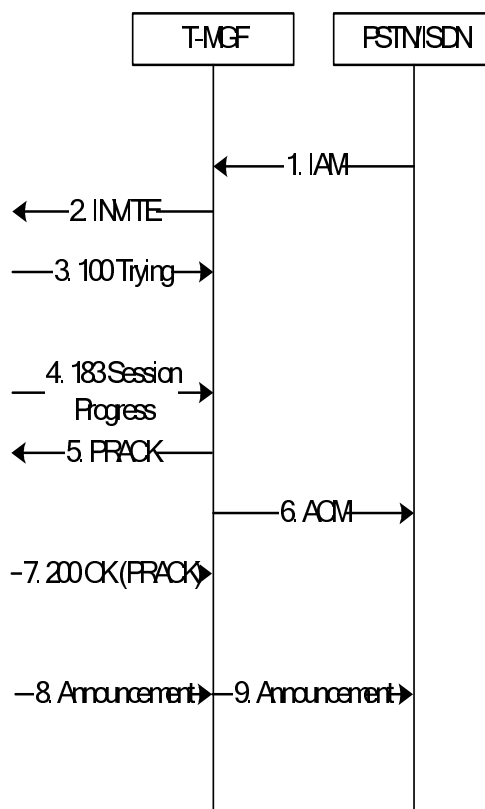
NOTE: The flow assumes the use of the option-tag "100rel" defined in RFC 3262 [5] other scenarios may also apply.

Figure A.4: Announcement provided towards a user connected to PSTN/ISDN during establishment of a communication

The steps of the flow are as follows:

1)   The MGCF receives an IAM from the PSTN/ISDN.

2)   The MGCF sends an INVITE request to the IP network. The request includes a SDP offer.

3)   The MGCF receives a 100 (Trying) response from the IP network.

4)   The MGCF receives a 183 (Session Progress) response from the IP network.

The response includes:

a)   the answer to the SDP offer sent in the INVITE request;

b)   a P-Early-Media header field set to "sendonly"; and

c)   the option-tag "100rel" in the Require header field.

5)   The T-MGF sends a PRACK request towards the IP network.

6)   The T-MGF sends an early ACM to the PSTN/ISDN. The early ACM contains the "in-band information may be available" indication.

7)   The MGCF receives a 200 (OK) response to the PRACK request.

8)   The MGCF receives the in-band announcement from the IP network and forwards the announcement to the PSTN/ISDN network.

Depending on the reason for the announcement the establishment of the communication continues or the establishment of the communication is aborted.

A.2   Providing announcements to a user during an established communication

The way an announcement is sent to a user during an established communication depends on the scenario and the importance of the announcement.

The following scenarios exist:

- scenario 1: two users are communicating with (at least) one AS in the signalling path (UE AS -UE); or,

- scenario 2: two (or more) users communicating with (at least) one AS in the signalling and media path (UE-AS/MRFC-UE); or

- scenario 3: two users communicate and one of the users are connected to PSTN/ISDN (UE-MGCF). This scenario can be seen as part of basic communication and requires no SIP signalling; or

- scenario 4: two users communicate directly with each other without involving an AS in the signalling path and without involving an AS in the media path (UE-UE). This scenario is out of scope of the present document.

A.2.1   Scenario 1: UE - AS - UE

Two users are communicating with (at least) one AS in the signalling path. In this scenario the AS is connected to the S-CSCF over the ISC interface acting as a SIP proxy or an AS performing 3rd party call control.

RFC 3261 [4] specifies the Call-Info header field as a means to indicate a source of media to be played by the receiving endpoint.

Figure A.5 shows an example of the use of this mechanism in the INVITE request.
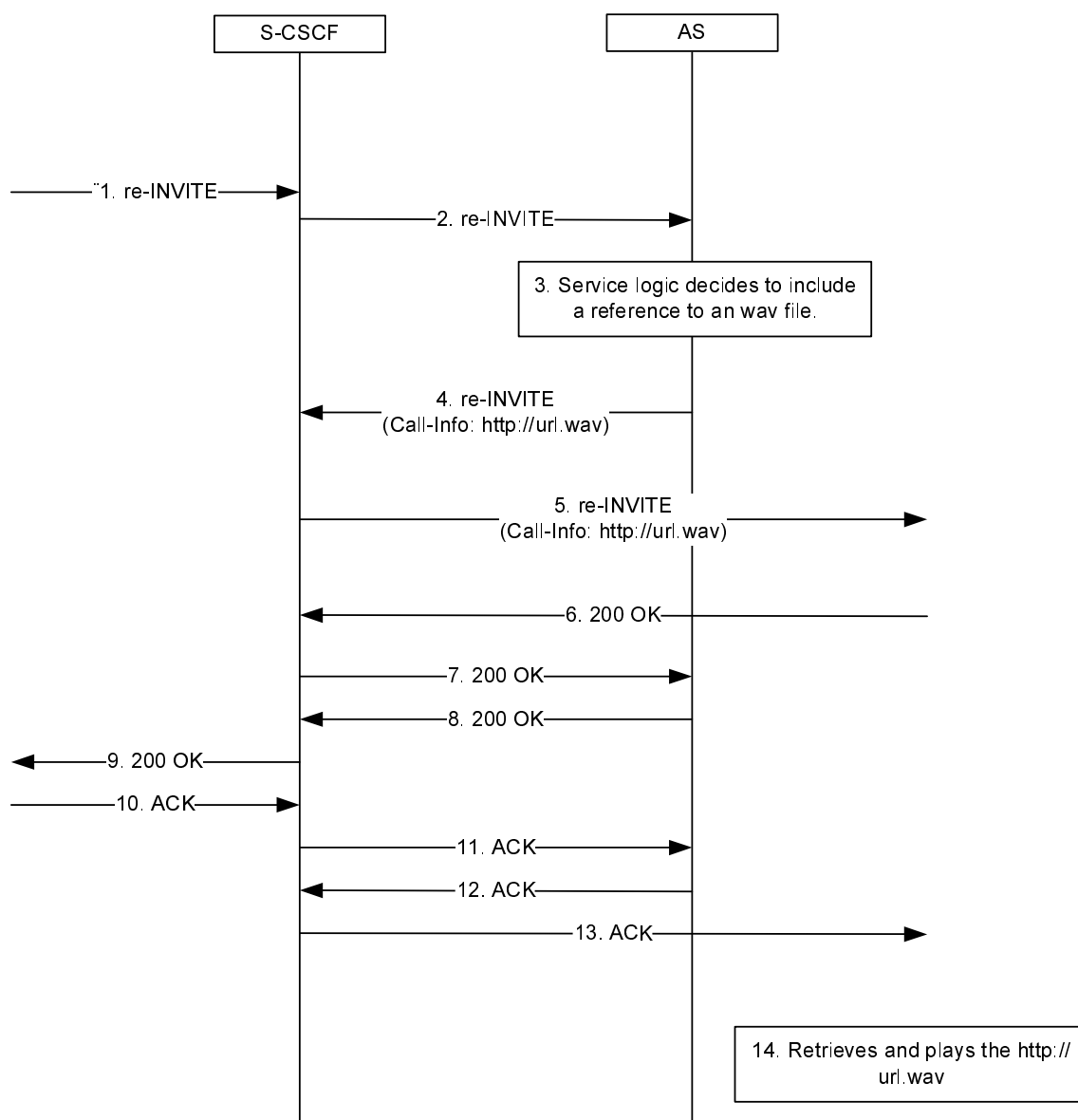
NOTE: Some signalling details are left out of the figure for simplicity.

Figure A.5: Call-Info header field in a re-INVITE request to indicate media

A user wants to place a communication session on hold and sends a re-INVITE request towards the remote user involved in the communication.

The steps of the flow are as follows:

1)   S-CSCF receives a re-INVITE from a user. The user can be a user served by this S-CSCF, a user served by another S-CSCF or a user connected to the PSTN via MGCF.

2)   S-CSCF sends the re-INVITE request along the signalling path to the AS using the route set received in the re-INVITE request.

3)   Service logic in the AS decides to include a reference to a wav file with an announcement or music.

4)   The AS sends the re-INVITE request to the S-CSCF. including a URL to a media file containing the appropriate announcement or music, for example http://operator.net/announcement.wav (in the picture abbreviated to http://url.wav).

5)   The S-CSCF sends the re-INVITE request along the signalling path towards the remote user. The remote user may be a user served by this S-CSCF, a user served by another S-CSCF or a user connected to the PSTN via MGCF.

6-9)   The 200 (OK) response from the remote user is forwarded via the S-CSCF and the AS towards the originating user.

10-13) The ACK request from the originating user is forwarded via the S-CSCF and the AS towards the remote user.

14)   The http://url.wav file is retrieved and played to the user. In the case the user is connected to the PSTN via a MGCF, the T-MGF retrieves and plays the announcement towards the user. In case the user is connected to IMS the UE retrieves and plays the announcement.

A.2.2   Scenario 2: UE - AS/MRFC/MRFP - UE

This clause describes the scenario when two (or more) users are communicating with (at least) one AS controlling the media path. The MRFP is in the media path. In this scenario the AS acts as a B2BUA.

Figure A.6 shows the signalling flow for the scenario.
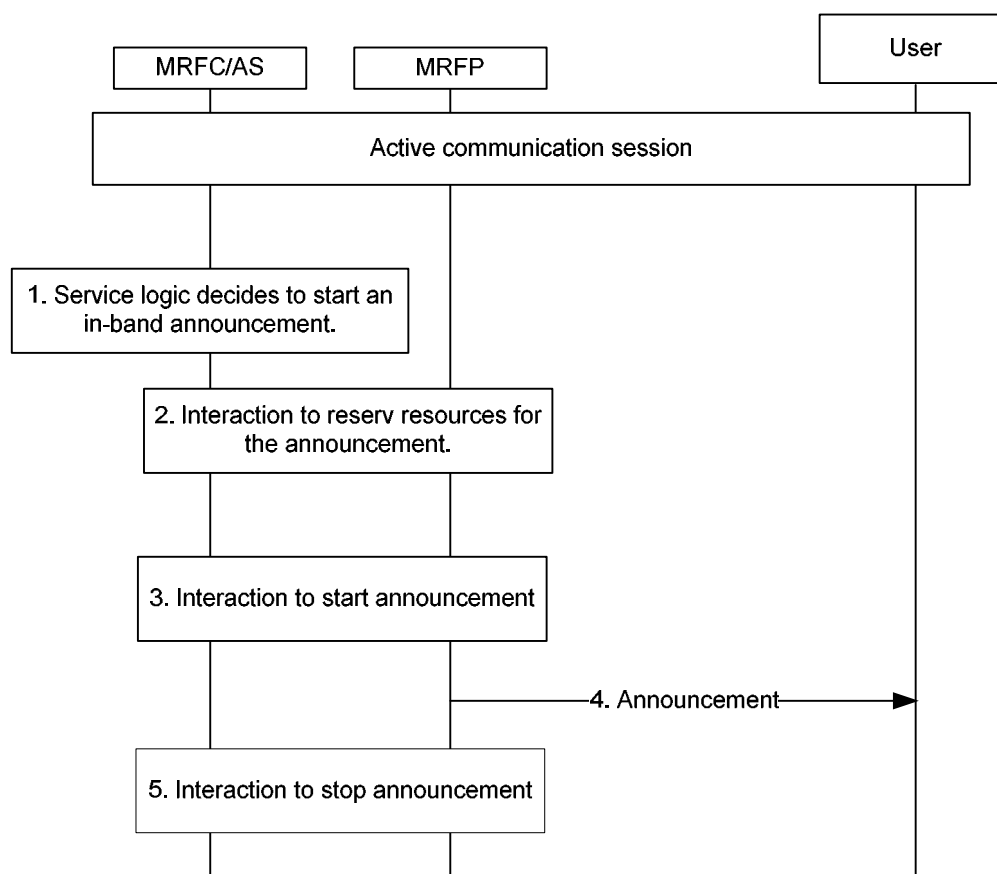
Figure A.6: In-band announcement during an established communication

An AS, acting as a B2BUA, is involved in a communication session. The AS controls the media path via a co-located MRFC controlling a MRFP.

The steps of the flow are as follows:

1)   Service logic in the AS decides to start an in-band announcement towards a user e.g. "Music on hold".

2)   The AS using the co-located MRFC interacts with the MRP in order to reserve resources for the announcement.

3)   The MRFC co-located with the AS interacts with the MRFP in order to start the announcement.

4)   The MRFP sends the announcement towards the remote user.

5)   The MRFC co-located with the AS interacts with the MRFP to stop the announcement.

A.3   Communication request rejected

Service logic in an AS, e.g. the ACR service, may decide to reject a communication request and provide an announcement to explain the reason for the rejection to the originating user. The AS can:

1)   Send the announcement as in-band information.

2)   Include a reference to the announcement in a 3xx, 4xx, 5xx and 6xx response.

A.3.1   Sending the announcement as in-band information

The network may generate announcement using one of the following procedures:

1)   Using early media i.e. the AS establish an early session and uses that early session to send the in-band announcement; or

2)   Using an established session i.e. the AS accepts the INVITE request and uses the established session to send the in-band announcement.

A.3.1.1 Using early media

This clause explains how an AS can use an early media session to send the in-band announcement and when the announcement is sent reject the communication request with an appropriate reject code.

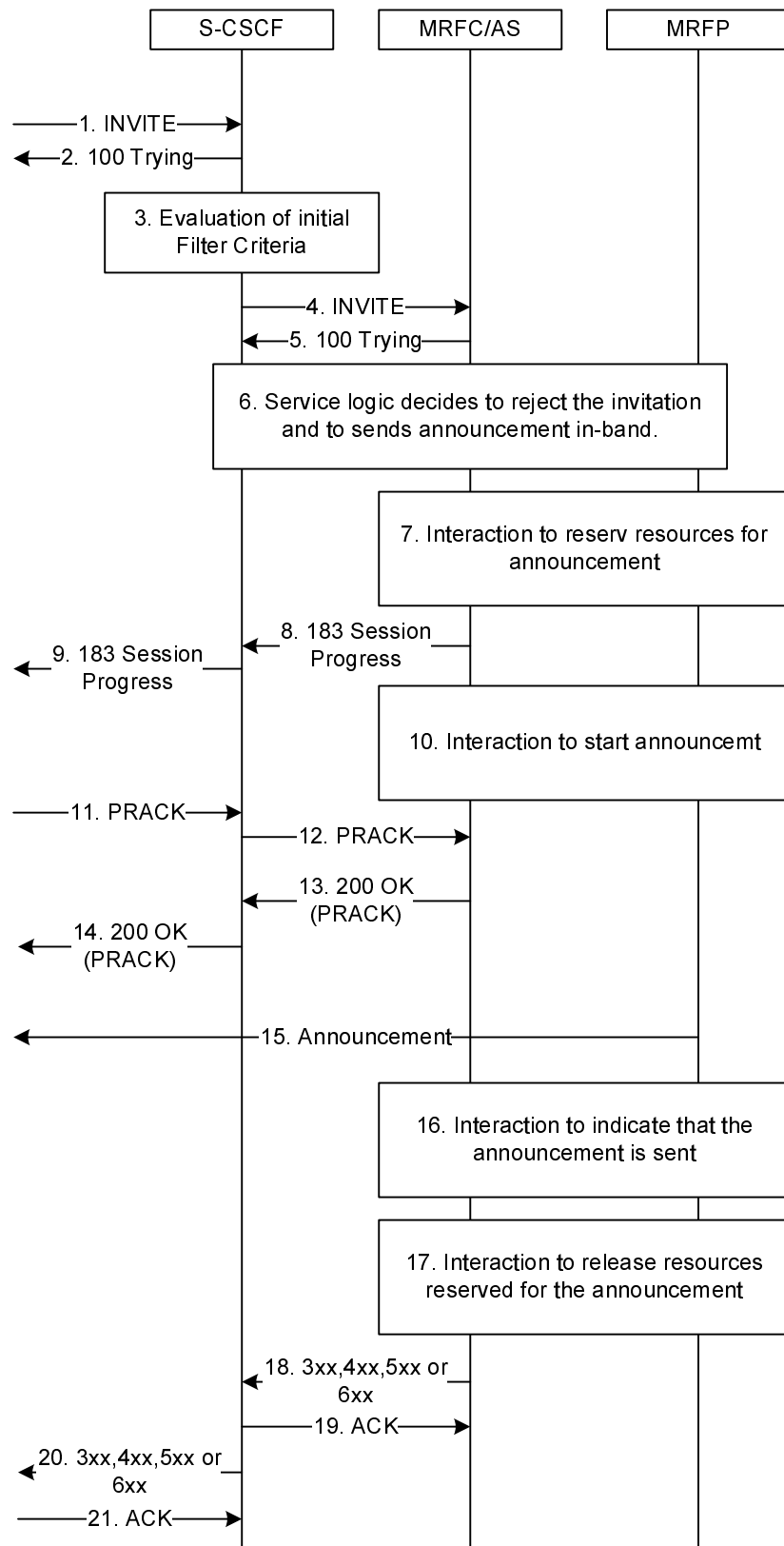Figure A.7 shows the signalling flow for the scenario.

Figure A.7: Using early media to send in-band announcement

The originating user initiates communication by means of an INVITE request. A long the path towards the terminating user an AS determines that the INVITE request cannot be forwarded to the terminating user. The steps of the flow are as follows:

1) S-CSCF receives an INVITE request from the originating user. The originating user may be a user served by this S-CSCF, a user served by another S-CSCF or a user connected to PSTN/ISDN via a MGCF.

2) S-CSCF sends a 100 (Trying) response.

3) S-CSCF evaluates the Initial Filter Criteria.

4) S-CSCF sends the INVITE request to the AS.

5) The AS sends a 100 (Trying) response to S-CSCF.

6) Service logic in the AS decides to reject the communication request and to send an announcement in-band in order to give a detailed reason to the originating user.

7) The MRFC collocated with the AS interact with the MRFP and reserves resources for the announcement.

The AS sends a 183 (Session progress) response to S-CSCF.
The response includes:

a)   the Require header field with the option-tag "100rel"; and

b)   an answer to the SDP received in the INVITE request;

c)   a P-Early-Media header field set to "sendonly".

8) S-CSCF sends the 183 (Session Progress) response towards the originating user.

9) The MRFC collocated with the AS interact with the MRFP in order to start the announcement.

10) S-CSCF receives a PRACK request from the originating user.

11) S-CSCF sends the PRACK request to the AS.

12) The AS sends the 200 (OK) response to the PRACK request to S-CSCF.

13) S-CSCF sends the 200 (OK) response to the PRACK request to the originating user.

14) MRFP sends the announcement towards the UE.

15) The MRFP interacts with the MRFC collocated with the AS to indicate that the announcement is sent.

16) The MRFC collocated with the AS interact with the MRFP in order to release resources reserved for the announcement.

17) The AS sends a 3xx, 4xx, 5xx or 6xx response to the INVITE request to S-CSCF.

18) S-CSCF sends an ACK request to the AS.

19) S-CSCF sends a 3xx, 4xx, 5xx or 6xx response to the INVITE request to the originating user.

20) S-CSCF receives an ACK request from the originating user.

A.3.1.2   Using an established session

This clause explains how an AS can use an established session to send the in-band announcement and when the announcement is sent, release the communication and include an appropriate reject code in the BYE request.

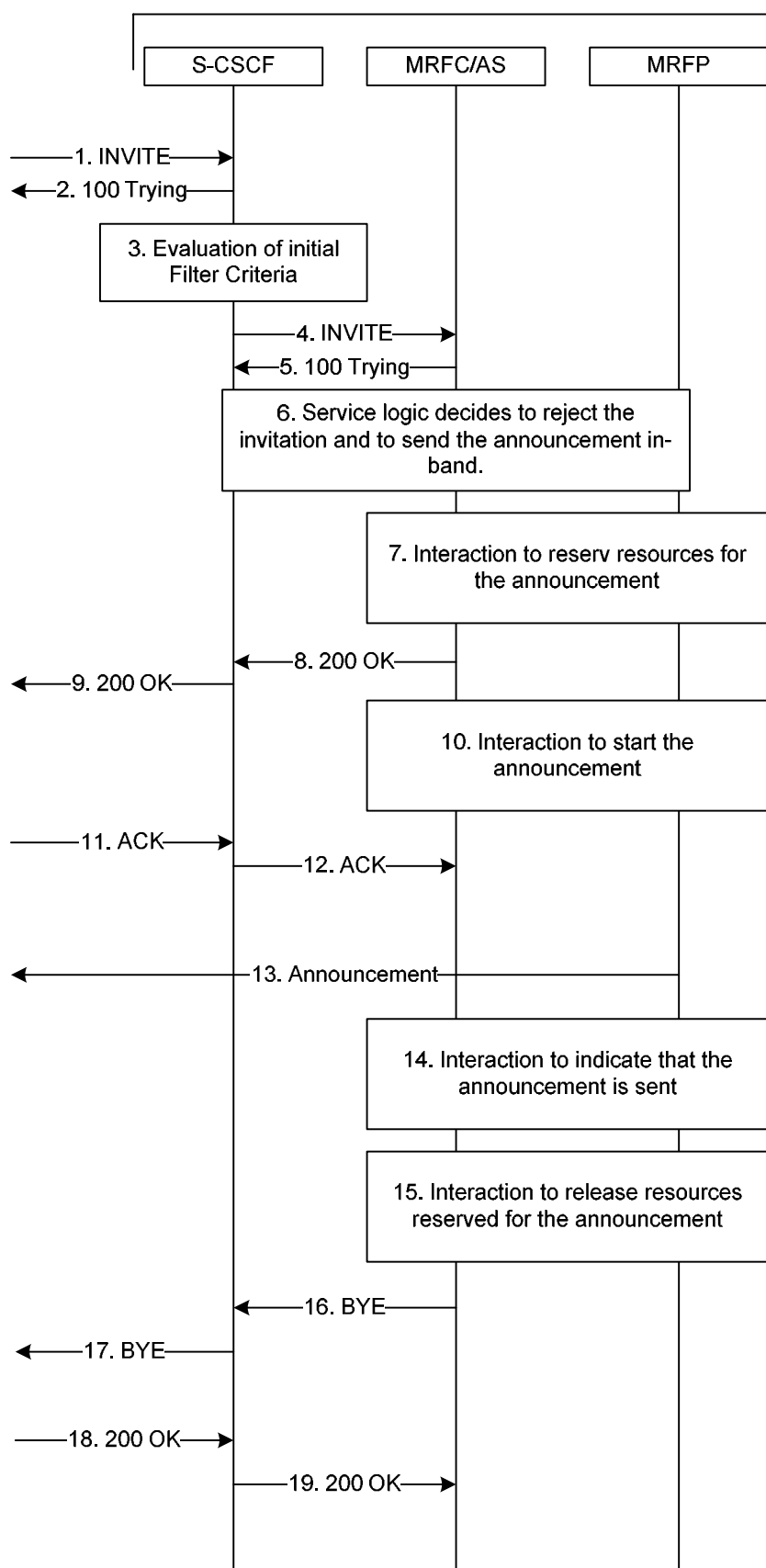Figure A.8 shows the signalling flow for the scenario:

**Figure A.8: In-band information generated by network when
an invitation to a communication is rejected**

The originating user initiates communication by means of an INVITE request. A long the path towards the terminating user an AS determines that the INVITE request cannot be forwarded to the terminating user.

The steps are as follows:

1) S-CSCF receives an INVITE request from the originating user. The originating user may be a user served by this S-CSCF, a user served by another S-CSCF or a user connected to PSTN/ISDN via a MGCF.

2) S-CSCF sends a 100 (Trying) response.

3) S-CSCF evaluates the Initial Filter Criteria.

4) S-CSCF sends the INVITE request to the AS.

5) The AS sends a 100 (Trying) response to S-CSCF.

6) The AS decides to reject the communication request and to send an announcement in-band in order to give a detailed reason to the originating user.

7) The MRFC collocated with the AS interact with the MRFP and reserves resources for the announcement.

8) The AS sends a 200 (OK) response to the INVITE request to S-CSCF.

9) S-CSCF sends the 200 (OK) response to the INVITE request towards the originating user.

10) The MRFC collocated with the AS interact with the MRFP in order to start the announcement.

11) S-CSCF receives an ACK request from the originating user.

12) S-CSCF sends the ACK request to the AS.

13) MRFP sends the announcement towards the originating user.

14) The MRFP interacts with the MRFC collocated with the AS to indicate that the announcement is sent.

15) The MRFC collocated with the AS interact with the MRFP in order to release resources reserved for the announcement.

16) The AS sends a BYE request to S-CSCF. The BYE request may include an appropriate reject reason.

17) S-CSCF sends the BYE request towards the originating user.

18) S-CSCF receives a 200 (OK) response to the BYE request from the originating user.

19) S-CSCF sends the 200 (OK) response to the BYE request to the AS.

A.3.2 Including an Error-Info header field in a 3xx, 4xx, 5xx and 6xx response

This clause explains how an AS can include a reference to an announcement stored in the network.

IETF defines an Error-Info header field for use in 3xx, 4xx, 5xx and 6xx responses to the INVITE request. The Error-Info header field transports a reference to a file e.g. a file containing an announcement.

When the originating UE receives the reference the UE retrieves the announcement and plays it for the user.
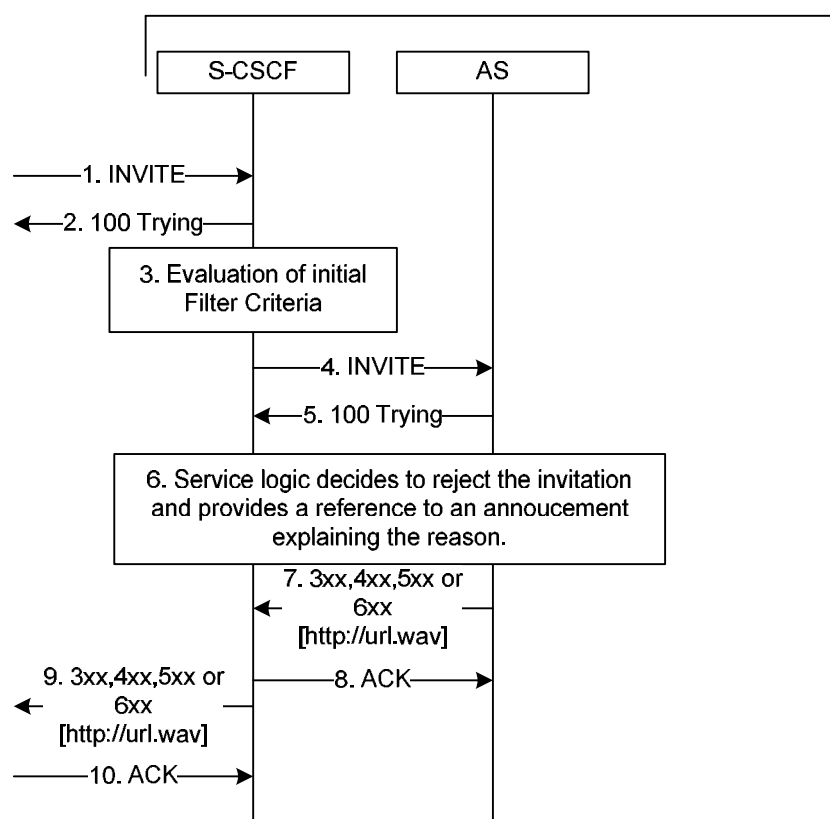
Figure A.9 shows the message flow for scenario:

Figure A.9: Error-Info header in 3xx, 4xx, 5xx and 6xx responses

The originating user initiates communication by means of an INVITE request. A long the path towards the terminating user an AS determines that the INVITE request cannot be forwarded to the terminating user.

The steps are as follows:

1) S-CSCF receives an INVITE request from the originating user (in the case the AS is an O-AS) or the originating network (in the case the AS is a T-AS).

2) S-CSCF sends a 100 (Trying) response.

3) S-CSCF evaluates the Initial Filter Criteria.

4) S-CSCF sends the INVITE request to the AS.

5) The AS sends a 100 (Trying) response to S-CSCF.

6) The AS decides to reject the invitation to communication and to provide a reference to an announcement explaining the reason in more detail.

7) The AS sends a 4xx, 5xx or 6xx response to S-CSCF. The application server inserts a valid Error-Info header field in either a 4xx, 5xx or 6xx response to the INVITE request, including a URL to a media file containing the appropriate tone, announcement or music.

EXAMPLE: http://operator.net/announcement.wav, in the picture abbreviated to http://url.wav, is played at the originating UE (after step 10).

8) S-CSCF sends the ACK request to the AS.

9) S-CSCF sends the 3xx, 4xx, 5xx or 6xx response towards the originating user.

10) S-CSCF receives the ACK request.

A.3.3   Announcements provided by the PSTN/ISDN

The signalling flow for this scenario is the same as the signalling flow example given in clause A.1.3.

## A.3.4   Announcement provided to a user connected to the PSTN/ISDN

The signalling flow for this scenario is the same as the signalling flow example given in clause A.1.4.

Annex B (informative):
Signalling flows for Network Determined User Busy (NDUB)

B.1   Basic call with UE busy with T-AS involvement (NDUB condition check)

This clause describes the signalling flow for the case when the user is busy but the network does not consider the user to be busy.

Figure B.1 shows the signalling flow for the scenario:
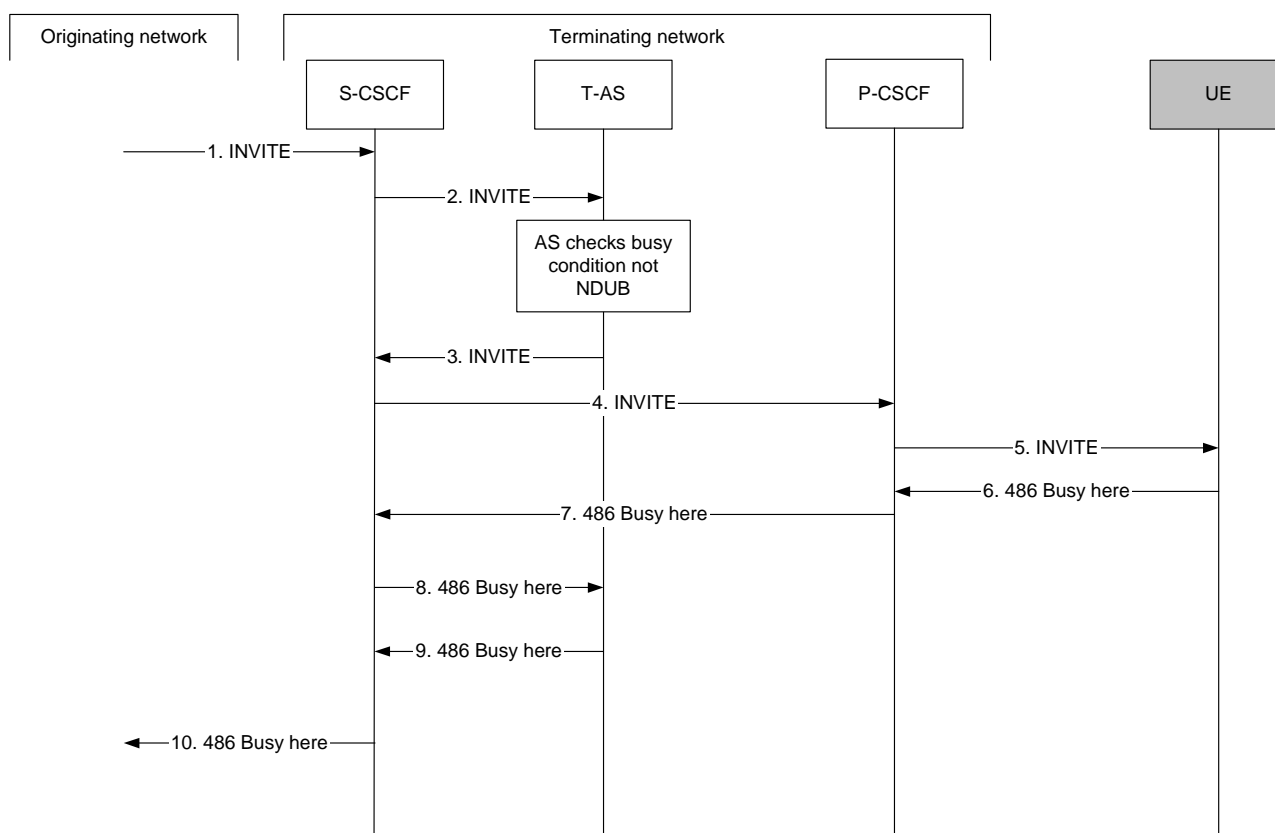
NOTE: The signalling flow is simplified for readability reasons.

Figure B.1: Basic call with UE busy with T-AS involvement (NDUB condition check)

This signalling flow assumes the following:

- the user in the terminating network needs the involvement of an AS for NDUB or other busy condition activated services like CCBS or CFBS; and

- The filter criteria are set for basic communication accordingly.

NOTE: the same scenario applies also for other error responses e.g. for the 403 (Service Denied) response, the 480 (Temporarily Unavailable) response.
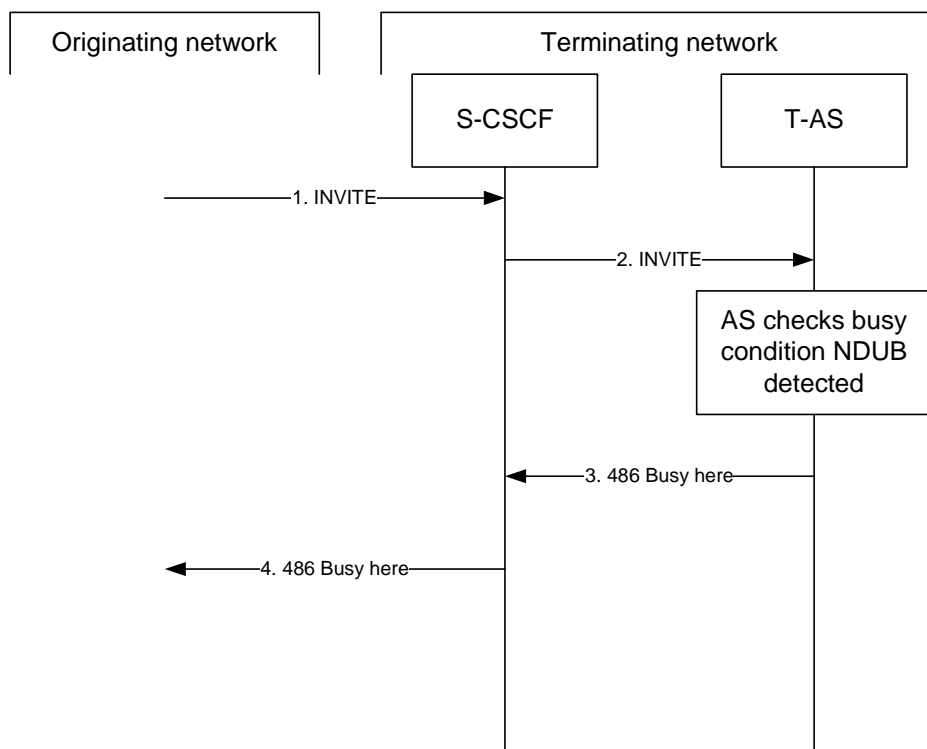
The steps of the flow are as follows:

1) The S-CSCF serving the terminating user receives an INVITE request from the originating network. The originating network may be a TISPAN IMS network, a PSTN/ISDN Emulation network, another SIP based network or a MGCF interworking with PSTN/ISDN.

2) The S-CSCF checks the IFC and finds that a trigger fires and sends the INVITE request to the AS. The address to the AS is obtained from the IFC.

3) The AS checks the busy condition and it is not NDUB and sends the INVITE request to the S-CSCF.

4) The S-CSCF sends the INVITE request according to the P-CSCF.

5) The P-CSCF sends the INVITE request according to the UE#2.

6) The UE#2 is e.g. involved in another communication and determine it self to be busy and sends a 486 (Busy here) response to the P-CSCF.

7) The 486 (Busy here) response to originating network via the S-CSCF and the AS.

B.2   Busy condition (NDUB) detected by terminating AS

This clause shows an example of a signalling flow when a terminating network determines the user to be busy i.e. the NDUB case.

Figure B.2 shows the signalling flow for the scenario.

NOTE: The signalling flow is simplified for readability reasons.

Figure B.2: Busy condition (NDUB) detected by terminating AS

This signalling flow assumes the following:

• the user in the terminating network needs the involvement of AS for NDUB or other busy condition activated services like CCBS or CFBS; and

• that the filter criteria is set for basic communication accordingly.

The steps of the flow are as follows:

1) The S-CSCF serving the terminating user receives an INVITE request from the originating network. The originating network may be a TISPAN IMS network, a PSTN/ISDN Emulation network, another SIP based network or a MGCF interworking with PSTN/ISDN.

2) The S-CSCF checks the IFC and finds that a trigger fires and sends the INVITE request to the AS. The address to the AS is obtained from the IFC.

3) The AS checks the busy condition and detects that it is NDUB and sends a 486 (Busy here) response to the S-CSCF.

4) The AS sends the 486 (Busy here) response to the originating network via the S-CSCF.

5) The S-CSCF sends the 486 (Busy here) response to the originating network.

Annex C (normative):
Use of the P-Early-Media header field

This annex defines the use of the P-Early-Media header field for use within SIP provisional responses to authorize the cut-through of backward and/or forward early media.

> NOTE: This annex is based on a draft intended to issued as an internet draft and can be removed when the internet draft becomes an RFC.

C.1   General usage of the P-Early-Media header field

A UAS requesting backward and/or forward early media shall include the P-Early-Media header field in a 18x provisional response to an incoming INVITE request, including a direction parameter that identifies whether the early media request is for backward media, forward media, both or neither. The UAS may change its request for early media by including a modified P-Early-Media header field in a subsequent 18x provisional response to the INVITE request.

The UAS may be a PSTN gateway providing in-band call progress information in the backward direction, or a network server requesting the input of a digit string as DTMF in the forward direction.

As members of the Trust Domain, each proxy in the network forwarding the 18x response has the responsibility for assuring that the early media request comes from an authorized source. If a P-Early-Media header field arrives from either an untrusted source, a source not allowed to send backward early media, or a source not allowed to receive forward early media, then the proxy may remove the P-Early-Media header field or alter the direction parameter of the P-Early-Media header field before forwarding the 18x response, based on local policy. A proxy shall authorize an early media request from a PSTN gateway, and shall disallow an early media request from user equipment or from an untrusted network.

If the proxy also performs gating of early media, then it shall use the direction parameter of the P-Early-Media header field to gate on/off backward and/or forward early media flow between the UAs.

If the UAC is a PSTN gateway, then the UAC uses the direction parameter of the P-Early-Media header field in the 18x provisional response to perform early media gating or cut-through and to decide whether or not to render backward early media in preference to generating ringback based on the receipt of a 180 Ringing response.

If the UAC is associated with user equipment, then the network shall assigned a proxy the task of performing early media gating, so that the direction parameter of the P-Early-Media header field received at such a UAC does not police the early media flow, but does provide additional information for the UAC to use in rendering media.

C.2   The P-Early-Media header field

The P-Early-Media header field may be included in any 18x provisional response to the INVITE request for the purpose of requesting the authorization of early media. The P-Early-Media header includes a single parameter "direction" that has one of the following values: "sendrecv", "sendonly", "recvonly", or "inactive", following the convention used for Session Description Protocol (SDP) IETF draft-ietf-mmusic-sdp-new [9] stream directionality. The value "sendrecv" indicates a request for authorization of early media both from the UAS towards the UAC and from the UAC towards the UAS (both backward and forward early media). The value "sendonly" indicates a request for authorization of early media from the UAS towards the UAC (backward early media), and not in the other direction. The value "recvonly" indicates a request for authorization of early media from the UAC towards the UAS (forward early media), and not in the other direction. The value inactive indicates either a request that no early media be authorized or a request for revocation of authorization of previously authorized early media. In networks using the P-Early-Media header field, the default in the absence of the header is either to request that no early media be authorized (in the absence of any previous early media authorization request) or to request that any previous early media authorization within the session remain unchanged.

The P-Early-Media header field is optional in any 18x provisional response to the INVITE request, and may be freely altered or deleted by any proxy.

NOTE: The gating of early media is performed by the P-CSCF and IBCF according to the requirement described in TS 182 006 [3], C.2.1 Procedures at the UAS (UAS).

A UAS that is requesting authorization to send or receive early media may insert a P-Early-Media header field with appropriate direction value in any 18x provisional response to the INVITE request. A UAS may request changes in early media authorization by inserting a P-Early-Media header with appropriate direction value in any subsequent 18x provisional response to the INVITE request.

C.2.1   Procedures at the proxy

To authorize or deny early media authorization requests, a proxy may modify or remove a P-Early-Media header field in any 18x provisional response to an INVITE request, depending on the trust relationship with the server sending or forwarding the 18x response. In addition, if the proxy controls the gating of early media in both directions for the UAC, it shall use the contents of the P-Early-Media header field to gate the early media according to the definition of the direction parameter defined in clause C.2.

C.2.2   Procedures at the UAC (UAC)

A UAC receiving a P-Early-Media header field in a 18x provisional response to an INVITE request may use the direction parameter of the header to gate or cut-through early media, and to decide whether to render early media from the UAS to the UAC in preference to any locally generated ringback triggered by a 180 (Ringing) response. If a proxy is providing the early media gating function for the UAC then the gateway model of RFC 3960 [6] for rendering of early media shall apply.

The UAC associated with a PSTN gateway in an IMS does not have a proxy configured to perform early media gating, so it needs to perform early media gating on its own. A UAC without a proxy in the network performing early media gating that receives a P-Early-Media header in an 18x provisional response to an INVITE request should perform gating or cut-through of early media according to the direction parameter of the header. Such a UAC may also use the direction parameter to decide whether to render early media from the UAS to the UAC in preference to any locally generated ringback triggered by a 180 (Ringing) response.

C.2.3   Formal P-Early-Media header syntax

The syntax of the P-Early-Media header is described upon the Augmented Backus-Naur Form (ABNF) RFC 2234 [2] extended by RFC 3261 [4]:

- P-Early-Media = "P-Early-Media" HCOLON em-direction.

- Cm-direction = "sendrecv" / "sendonly" / "recvonly" / "inactive".

Annex D (normative):
Application Server (AS) establishing multiple dialogs with originating UE

D.1   General

If the AS needs to establish an early dialog between itself and the originating UE (or originating network), for example in order to establish a media path in order to send announcements or other kind of early media backwards, it shall do so by sending a provisional response towards the originating UE. The setup procedures between the originating UE and the AS are identical to normal setup procedures.

The To header tag value in the dialog between the originating UE and the AS shall, in order to separate the dialogs, be different than the To header tag value in messages used on the dialog used between the originating and terminating UEs. The AS normally receives the To header tag value for the dialog between the UEs from the terminating UE (or the terminating network), but if the AS acts as a B2BUA it may also, depending on the functionality, generate a new To header value.

The need for the AS to establish an early dialog between itself and the originating UE is determined on the services offered to the originating UE.

NOTE 1: Unless the originating UE can determine that the messages sent on the early dialog between itself and the AS are originated from the AS, it will assume that forking has occurred in the network.

NOTE 2: If the originating UE has indicated that it does not want the initial INVITE to be forked, the AS may still establish a separate early dialog between itself and the originating UE, since even though the originating UE may assume that the call has been forked only one terminating UE will actually receive the INVITE request.

NOTE 3: Once the originating UE has received 200 (OK) from the terminating UE the early dialog between the originating UE and the AS will be terminated, as described in RFC 3261 [4].

Annex E (informative):
Bibliography

ETSI TS 123 218: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia (IM) session handling; IM call model; Stage 2 (3GPP TS 23.218)".

ETSI TS 181 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Multimedia Telephony with PSTN/ISDN simulation services".

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History

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