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Abstract of document:

TS 24.228 contain “Signalling flows for the IP multimedia call control based on SIP and SDP”. It is the specification used to agree and convey current CN working assumptions with respect to the use of SIP and SDP in relation to the IMS and used as a basis for filling in the details of TS 24.229.

Changes since last presentation to TSG Meeting #14:

TS 24.228 is now estimated by CN1 to be 85% complete and it is proposed to move the specification under change control.

The increment from version 24.228v201 to 24.228v202 is due to editorial modifications after some checking towards TR21.801 (Specification drafting rules).

Outstanding Issues:

- Notation of tokenisation, both definition and implementation throughout the TS
 - Removal of the conflict between 23.228 and 24.228 in case GGSN and P-CSCF are not in the same network as UE?
 - What shall be encoded in To and From headers by the UE?
 - Does a Re-INVITE need to be forwarded to AS by the S-CSCF?
 - Clause 17.6 Error handling: Session Initiation - Empty clause
 - Editor's notes in 24.228 must be deleted or replaced with normative text
 - Systematic checking of correct use of defined terminology
 - Systematical checking of reserved words {can, must, may, will, shall }
-

Contentious Issues:

None.

3GPP TS 24.228 V2.0.2 (2002-03)

Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Core Network;
Signalling flows for the IP multimedia call control based
on SIP and SDP;
Stage 3
(Release 5)**



Keywords

Core Network, IMS, SIP, SDP

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Foreword

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

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 gives examples of signalling flows for the the IP multimedia call control based on SIP and SDP.

These signalling flows demonstrate the interaction with the IP-connectivity network (GPRS), and with the protocol provided at the Cx interface.

These signalling flows provide detailed signalling flows, which expand on the overview information flows provided in 3GPP TS 23.228 [2].

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 TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.228: "IP multimedia subsystem; Stage 2".
- [3] IETF 2543bis: "SIP: Session Initiation Protocol" (ietf-sip-rfc2543bis-05.txt)
- [4] IETF RFC 2782: "A DNS RR for specifying the location of services (DNS SRV)".
- [5] IETF RFC 2806: "URLs for Telephone Calls".
- [6] IETF RFC 2916: "E.164 number and DNS".
- [7] 3GPP TS 33.203: "Access security for IP based services".
- [8] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".
- [9] 3GPP TS 29.207: "End to end Quality of Service (QoS); stage 3".
- [10] 3GPP TS 29.060: "General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".
- [11] 3GPP TS 29.228: "IP Multimedia (IM) Subsystem Cx Interface; Signalling flows and message contents".
- [12] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core Network Protocols; Stage 3".

Editors Note: This reference to 2543 will need to be updated to reference the assigned RFC number, once the draft achieves RFC status within the IETF.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

IM CN subsystem: (IP Multimedia CN subsystem) comprises of all CN elements for the provision of IP multimedia applications over IP multimedia sessions

IP multimedia session: set of multimedia senders and receivers and the data streams flowing from senders to receivers. IP multimedia sessions are supported by the IP multimedia CN Subsystem and are enabled by IP connectivity bearers (e.g. GPRS as a bearer).

A user may invoke concurrent IP multimedia sessions.

Stateful proxy: logical entity that maintains state information at least for the duration of a SIP transaction [3]

3.2 Abbreviations

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

BGCF	Breakout Gateway Control Function
CN	Core Network
CSCF	Call Session Control Function
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
FQDN	Fully-Qualified Domain Name
G-MSC	Gateway Mobile Switching Centre
GPRS	General Packet Radio Service
HSS	Home Subscriber Server
I-CSCF	Interrogating-CSCF
IM	IP Multimedia
IP	Internet Protocol
IPv6	IP version 6
MEGACO	MEdia GAteway COntrol
MGCF	Media Gateway Control Function
MGW	Media Gateway
P-CSCF	Proxy-CSCF
PDP	Packet Data Protocol
PSTN	Public Switched Telephone Network
QoS	Quality of Service
SBLP	Service-based local policy
S-CSCF	Serving-CSCF
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SS7	Signalling system no. 7
UE	User Equipment
URI	Uniform Resource Identifier
USIM	User Service Identity Module

4 Methodology

Editor's note: This clause is to give a general key to the interpretation of the signalling flows that are provided elsewhere in this document.

Editor's note: The level of detail provided in the individual signalling flows should be as follows:

- A sequence diagram showing all methods involved in the transaction, and identifying all methods in the sequence with a referenceable identifier. This diagram may be a copy or a derivation of a diagram in 23.228, although there may be many more such diagrams. As such, the diagrams should use the same template and drawing package as the diagrams in 23.228. As such, as 23.228 evolves, so will this document.
- Using the referencerable identifier, an example of the contents of the method, showing all appropriate headers and body information (including SDP).

- Using the referencerable identifier, an example of the contents of the flows to the HSS, and the data stored in the HSS. Note that this may require some agreement with working group CN4.
- Using the referencerable identifier, an example of the data stored in the SIM. Note that this may require some agreement with TSG T.

Editor's note: The number of clauses at header level 1 is intended to be open ended, and header levels below this may be broken down as required. The lowest level clauses will always be x.x.1 – Normal operation, and x.x.2 – Exceptional operation. An emphasis is placed on the use of generic error handling where possible, particularly for the case of syntactic errors, therefore the "Exceptional operation subclause may well be empty, or used to show service level rejection of the request.

Editor's note: Some of the flows will have fixed contents, and some will be examples. Some will be constrained to a set of values. We need a mechanism of distinguishing these flow contents from each other.

Editor's note: It may be possibly to use the same flow contents to describe different message flows, in order to make the document more concise. This needs to be done after the various routing and via headers have been inserted, and after the various naming conventions for the URLs have been rationalised.

4.1 Key required to interpret signalling flows

This subclause lists the keys required to interpret all Signalling Flows in this Specification.

4.1.1 Key required to interpret signalling flow contents tables

Editor's Note: At CN1#18 it was agreed that we delay the implementation of N1-010893 until:

- (a) there has been a clean-up of the current table contents. The reason is to avoid propagating any current errors. 24.228v110 currently contains 1,359 tables with 12,505 headers. 7,437 of which are currently blanked.
- (b) a script can be developed to implement the Key algorithm to apply the updates to the text or additional help is volunteered to manually implement the updates.
- (c) a final decision is made that use of bold text is the best method to highlight added headers or modified contents
- (d) the specification is nearing completion. Implementing the new scheme at this stage in the specification lifecycle will require manual implementation of "bolding" text in all subsequent contributions.

It should be noted that some doubts were raised at CN1#18 about the use of bold text, as proposed in N1-010893. Bold text often appears as regular text when printed. Delegates were asked to bring forward better proposals in the in-term.

Contents tables are used to describe the contents of SIP methods. The following key (rules) have been applied to each contents table to improve readability, reduce errors and increase maintainability:

- a) Where a header field in the SIP method contents tables show only the header name, the contents are identical to the received request/response. The received request/response is identified as follows:
 - where a request is generated as a result of a received request (as at a proxy), then the received request is that with the same method name and Cseq header;
 - where a response is generated as a result of a received response (as at a proxy), then the received response is that with the same method name and Cseq header;
 - where the response is generated as a result of a received request or response (as at a UA), then the received request is that with the same method name and Cseq header;
 - where the request is generated as a result of a received response (as at a UA) then the received response is that immediately previously received.

To enhance readability an indication of the received request/response is included in the method title, should the received request/response not be the immediate preceding request response.

- b) The (...) sequence of characters is used to indicate that the Content-Length field needs to be filled in, with the appropriate value i.e. the number of bytes in the payload.

- c) Repeated headers within a method are listed on a single line, with a comma used as delimiter. This convention is not mandatory but used in this specification for improved readability.
- d) Headers are listed within a table in the following order:
 - 1) hop by hop e.g. Via:
 - 2) end to end e.g. To:
 - 3) entity headers e.g. Content-Length:

This convention is not mandatory but used in this specification for improved readability.

4.1.2 Key required to interpret signalling flow figures

In order to differentiate between SIP methods and other protocol messages, the message name is preceded with the associated protocol for all *non-SIP* messages (e.g. GPRS: Activate PDP Context).

4.2 Notation conventions

4.2.1 Introduction

This subclause details the notation conventions used in the present document.

4.2.2 User Identities

UE#1's public user identities are:

user1_public1@home1.net

user1_public2@home1.net

etc.

UE#1's private user identity is:

user1_private@home1.net

UE#2's public user identities are:

user2_public1@home2.net

user2_public2@home2.net

etc.

UE#2's private user identity is:

user2_private@home2.net

4.2.3 Network Entities

a) UE#1's associated entities:

UE#1's home network is:

home1.net

The P-CSCF serving UE#1 in home1.net is:

pcscf1.home1.net

The S-CSCF serving UE#1 is:

scscf1.home1.net

The I-CSCF in UE#1's home network (between proxy and serving CSCF) is:

icscf1_p.home1.net

If there are two I-CSCFs in home1.net involved in the call flows, then they are (from the left side of the individual call flow to its right side):

icscf1_p.home1.net

icscf1_s.home1.net

NOTE 1: Typically, the second I-CSCF will be between two S-CSCFs (hence use of "s").

UE#1 is roaming in:

visited1.net

The P-CSCF serving UE#1 in visited1.net is:

pcscf1.visited1.net

The BGCF serving UE#1 is:

bgcf1.home1.net

The MGCF serving UE#1 is:

mgcf1.home1.net

b) UE#2's associated entities (where UE#2's home and/or visited network is different from that of UE#1):

UE#2's home network is:

home2.net

The P-CSCF serving UE#2 in home2.net is:

pcscf2.home2.net

The S-CSCF serving UE#2 is:

scscf2.home2.net

The I-CSCF in UE#2's home network (between proxy and serving CSCF) is:

icscf2_p.home2.net

If there are two I-CSCFs in home2.net involved in the call flows, then they are (from the left side of the individual call flow to its right side):

icscf2_s.home1.net

icscf2_p.home1.net

NOTE 2: Typically, the second I-CSCF will be between two S-CSCFs (hence use of "s").

UE#2 is roaming in:

visited2.net

The P-CSCF serving UE#2 in visited2.net is:

pcscf2.visited2.net

The BGCF serving UE#1 is:

bgcf2.home2.net

The MGCF serving UE#1 is:

mgcf2.home2.net

c) UE#2's associated entities (where UE#2's home and/or visited network is the same as that of UE#1):

UE#2's home network is:

home1.net

The P-CSCF serving UE#2 in home1.net is:

pcscf2.home1.net

The S-CSCF serving UE#2 is:

scscf2.home1.net

The I-CSCF in UE#2's home network (between proxy and serving CSCF) is:

icscf2_p.home1.net

If there are two UE#2 I-CSCFs involved in the call flows, then they are (from the left side of the individual call flow to its right side):

icscf2_s.home1.net

icscf2_p.home1.net

NOTE 3: Typically, the second I-CSCF will be between two S-CSCFs (hence use of "s").

UE#2 is roaming in:

visited1.net

The P-CSCF serving UE#2 in visited2.net is:

pcscf2.visited1.net

The BGCF serving UE#1 is:

bgcf2.home1.net

The MGCF serving UE#1 is:

mgcf2.home1.net

d) UE#3's (i.e. target in call transfer scenario) associated entities (where UE#3's home and/or visited network is different from that of UE#1 and UE#2):

If there is a Call Transfer, then the Transfer Target is UE#3

UE#3's home network is:

home3.net

The S-CSCF serving UE#3 is:

scscf3.home3.net

The I-CSCF in UE#3's home network (between proxy and serving CSCF) is:

icscf3_p.home3.net

If there are two I-CSCFs in home3.net involved in the call flows, then they are (from the left side of the individual call flow to its right side):

icscf3_s.home3.net

icscf3_p.home3.net

NOTE 4: Typically, the second I-CCSF will be between two S-CSCFs (hence use of "s").

UE#3 is roaming in:

visited3.net

The P-CSCF serving UE#3 in visited3.net is:

pcscf3.visited3.net

The BGCF serving UE#1 is:

bgcf3.home3.net

The MGCF serving UE#1 is:

mgcf3.home3.net

4.3 Document Structure

To improve readability, the document is structured at the highest level based on network configuration hiding. Each clause 'x' for the non-hiding scenario is mirrored for hiding, in a subsequent clause 'x+10'.

For example:

Clause 6: Signaling flows for REGISTER (non-hiding)

Clause 16: Signaling flows for REGISTER (hiding)

Clause 7: ... (non hiding)

Clause 17: ... (hiding)

etc.

5 Elements of signalling flows for provision of IP-connectivity network

Editor's note: The intent of this subclause is to provide set of subflows, that can be referred to from other flows, that show the creation of appropriate PDP contexts, and the maintenance and tearing down of those PDP contexts.

Editor's note: The mechanism for communicating the CSCF address that the proxy forwards INVITEs to in the 200 OK message is for further study.

Editor's note: Input is required from SA3 on the authentication of the user and which network entity does this.

5.1 Introduction

Prior to communication with the IM CN subsystem, a successful GPRS attach procedure must be performed. Further a PDP context to be used for the SIP signalling must be established. This PDP context is established towards the GGSN in the H-PLMN or V-PLMN according to the APN and GGSN selection criteria described in 3GPP TS 23.060. The PDP context will provide the UE with an IPv6 address, which will serve as the host address for the duration of the PDP context.

The PDP context where the SIP signalling is performed must be available as long as services from the IM CN subsystem are wanted.

5.2 PDP context activation and P-CSCF discovery procedures

5.2.1 Introduction

The Proxy-CSCF discovery shall be performed after GPRS attach and after or as part of a successful activation of a PDP context using one of the following mechanisms:

- Employ DHCP and if needed DNS to obtain the P-CSCF address as described in subclause 5.2.2.
- Obtain the Proxy-CSCF address from the PDP Context Activation signalling as described in subclause 5.2.3. The UE can freely decide which of the described mechanisms it will use to acquire the P-CSCF address. In case several P-CSCF addresses are provided to the UE without sufficient priority indication, the selection of which P-CSCF address to use by the UE is implementation specific.

5.2.2 DHCP procedure for P-CSCF discovery

In DHCP procedures for P-CSCF discovery, the UE employs DHCP and if needed DNS to obtain the P-CSCF address.

Editor's Note: This approach needs further study on the interactions with the restrictions on the Signalling PDP Context, TS 23.228 subclause 4.2.6.

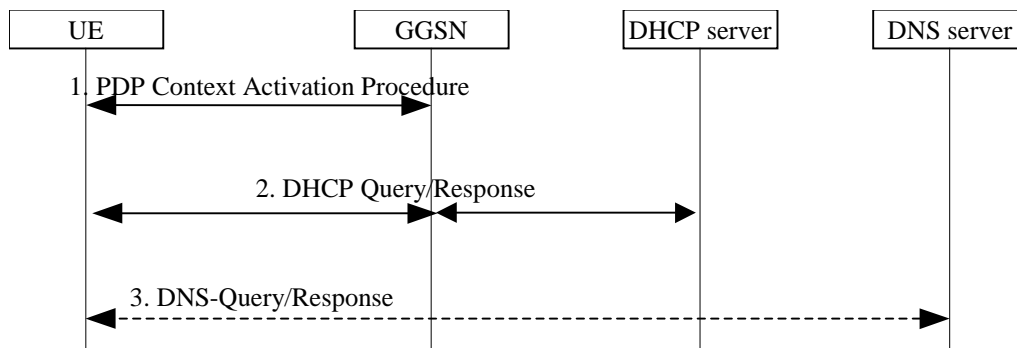


Figure 5.2.2-1: P-CSCF discovery using DHCP and DNS

1. PDP Context Establishment Procedure (UE to GPRS)

Establishment of appropriate PDP context bearer by using the PDP Context Establishment procedure as specified in 3GPP TS 24.008.

2. DHCP Query/Response (UE to DHCP)

The UE sends a request to a DHCP server. It may request a list of fully qualified domain names of P-CSCF(s) and the IP addresses of the DNS servers, or it may request a list of P-CSCF(s) IP address(es). Multiple DHCP Query/Response message exchange may be required to retrieve the requested information.

3. DNS Query/Response (UE to DNS)

If P-CSCF address(es) are not received in the DHCP Query/Response, the UE performs a DNS query to retrieve a list of P-CSCF(s) IP addresses from which one is selected. If the response does not contain the IP addresses an additional DNS query is needed to resolve a Fully Qualified Domain Name (FQDN) to an IP address.

Table 5.2.2-3a DNS: DNS Query (UE to DNS)

```

OPCODE=QUERY
QNAME=_sip._udp.pcscf.visited1.net, QCLASS=IN, QTYPE=SRV
  
```

The DNS records are retrieved according to RFC 2782 [4].

Table 5.2.2-3b DNS Query Response (DNS to UE)

```

OPCODE=QUERY, RESPONSE, AA
QNAME=_sip._udp.pcscf.visited1.net, QCLASS=IN, QTYPE=SRV
  
```

```

-----
_sip._udp.pcscf.visited1.net      0 IN SRV 1 10 5060 pcscf1.visited1.net
                                0 IN SRV 1 0 5060 pcscf7.visited1.net
pcscf1.visited1.net              0 IN AAAA      5555::aba:dab:aaa:daa
pcscf7.visited1.net              0 IN AAAA      5555::ala:b2b:c3c:d4d
-----

```

In the Answer field of the query-response each P-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the P-CSCF (i.e. the pcscf1.visited1.net). Since the Additional Data field of the query-response also contains the IP address of the selected P-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

5.2.3 GPRS procedure for P-CSCF discovery

GPRS procedures for P-CSCF discovery using the procedure specified in 3GPP TS 24.008 for establishment of an appropriate PDP context for IM subsystem signalling. The request for P-CSCF address(es) and the response P-CSCF address(es) are transparent to the SGSN.

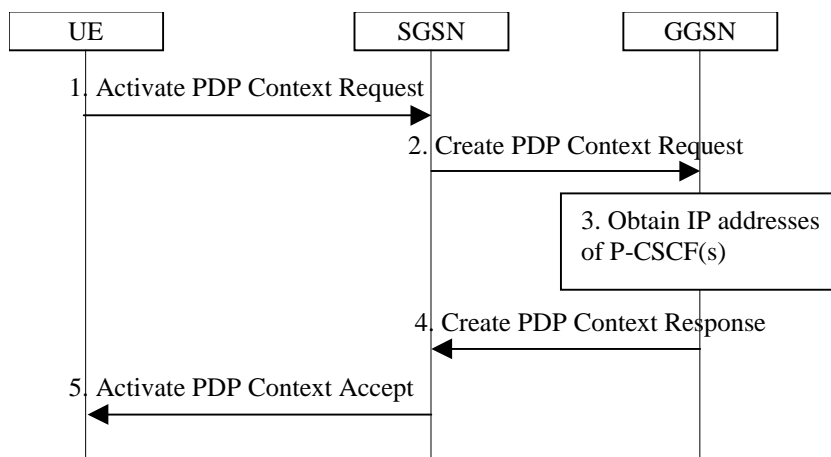


Figure 5.2.3-1: P-CSCF discovery using PDP Context Activation signalling

1. Activate PDP Context Request (UE to SGSN)

UE requests establishment of a PDP context by using procedure as specified in 3GPP TS 24.008. The UE indicates that it requests a P-CSCF IP address(es).

2. Create PDP Context Request (SGSN to GGSN)

The SGSN selects a GGSN according to the APN selection criteria and forward the request to the GGSN.

3. Obtain P-CSCF address(es)

The GGSN obtains IP address(es) of P-CSCF(s) in the same network.

NOTE: The mechanism to do this is a matter of internal configuration and is an implementation decision.

4. Create PDP Context Response (GGSN to SGSN)

The GGSN forwards the P-CSCF address(es) to the SGSN.

5. Activate PDP Context Accept (SGSN to UE)

The GGSN includes the IP address(es) of P-CSCF(s) in the response as specified in 3GPP TS 24.008.

5.3 End-to-End QoS and signalling call flows interactions

5.3.1 Mobile Originating with Service-based Local Policy, without resource reservation protocol, only GPRS procedures

Figure 5.3.1-1 shows an example of the GPRS and the COPS interactions during a session setup when SBLP is being applied. Because the S-CSCF is not involved in GPRS interaction, it is not shown in the flow, but it is assumed that the S-CSCF or I-CSCF is the next entity in the signalling flow.

This example is appropriate for a SIP QoS Assured session although only SBLP aspects are highlighted. It is assumed in this example that both the UAC and UAS have chosen to use the GPRS procedures to guarantee the QoS, which means both the UAC and UAS establish satisfactory PDP context on their respective accesses. It is assumed that the core network is DiffServ enabled and service based local policy (SBLP) decisions are taken by the PCF. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.

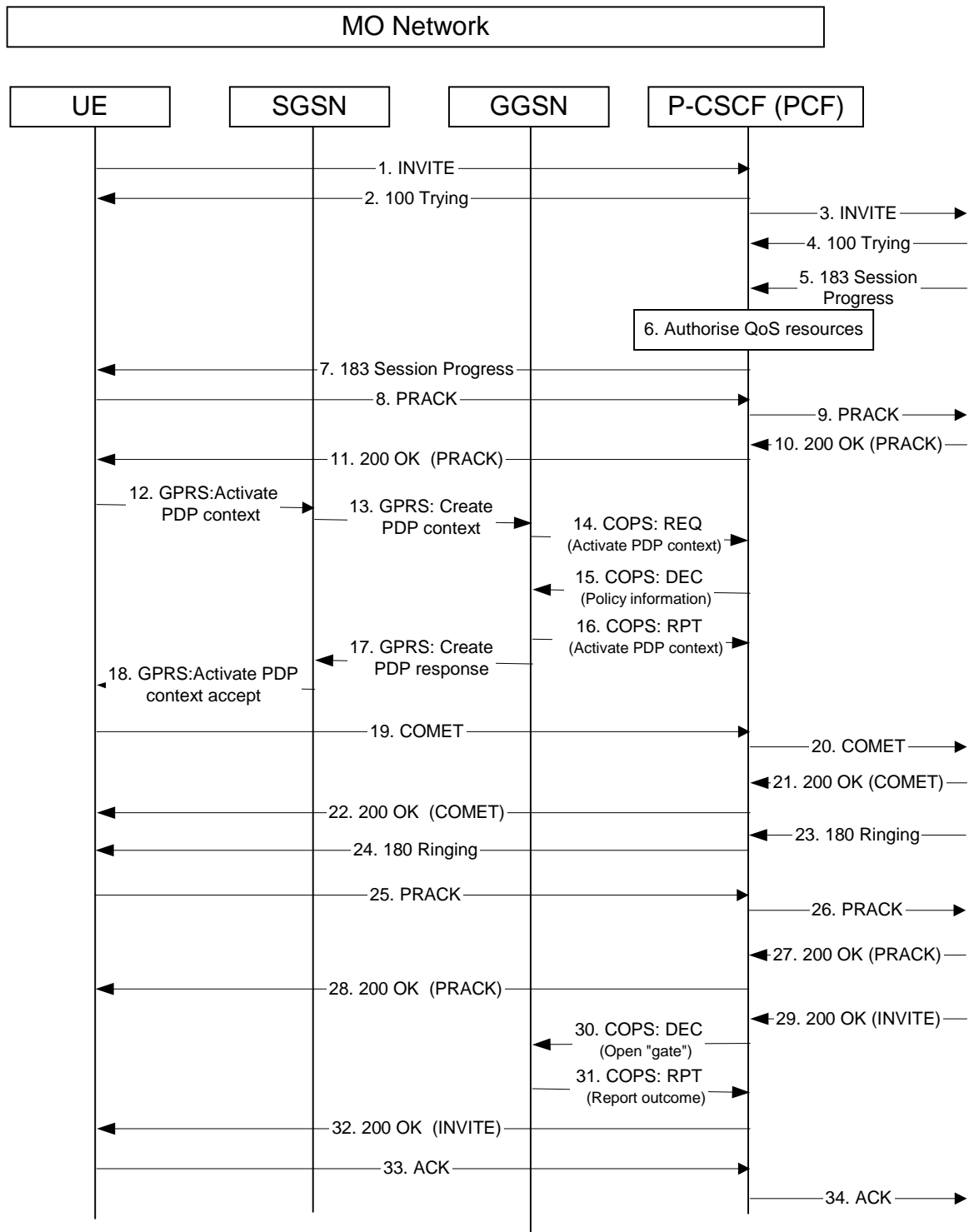


Figure 5.3.1-1: Interaction between SIP/SDP, GPRS and COPS, Mobile originating side

Only the relevant SIP, GPRS and COPS messages are mentioned in this subclause. The complete SIP messages are detailed in subclause 7.2.2. The GPRS messages are detailed in 3GPP TS 24.008 and 3GPP TS 29.060. The COPS messages are detailed in 3GPP TS 29.207.

6. Authorise QoS Resources

At the reception of the 183 Session Progress response at the P-CSCF, the P-CSCF obtains the Media Authorisation Token from the PCF.

7. 183 Session Progress (P-CSCF to UE)

This message shall contain the Media Authorisation header, which holds the Media Authorisation Token. Upon receipt of the Media Authorisation Token, the UE generates a flow identifier which identifies an IP media flow associated with the SIP session. The Flow Identifiers are based on the sequence of media flows in the SDP. A Flow Identifier combined with the Authorization Token shall be sufficient to uniquely identify an IP media flow.

12. GPRS: Active PDP Context (UE to SGSN)

The UE sends an Activate PDP Context message to the SGSN as defined in 3GPP TS 24.008. The UE associates the PDP context to the session by including the media authorisation token information and the flow identifier(s) information. The PDP context is bi-directional.

Editors note: The encoding of the media authorisation token information and flow identifiers in the GPRS Active PDP Context message is for further study.

Editors note: The mapping of SDP to the UMTS QoS parameters is being considered within CN3.

Editor's Note: It shall be possible that PDP Context activation starts immediately after the reception of the 183 Session Progress, to save the time for call setup.

13. GPRS: Create PDP Context (SGSN to GGSN)

The SGSN checks the user profile to authorise the requested QoS and also the available resource, if both are granted, it sends the corresponding Create PDP Context message to the GGSN as defined in 3GPP TS 29.060. This message contains the media authorisation token information and the flow identifier(s) information.

14. COPS: REQ (GGSN to PCF)

When the Create PDP Context message is received in the GGSN containing the media authorisation token information and the flow identifier(s) information, the PEP in the GGSN shall send a COPS REQ message to the PCF as described in 3GPP TS 29.207. The PCF verifies that the media authorisation token information and the associated flow identifier(s) information are as expected.

15. COPS: DEC (PCF to GGSN)

The PCF sends a COPS DEC message back to the GGSN.

Editors note: The contents of the COPS DEC message, and the interaction with the PEP is currently being considered within CN3.

16. COPS: RPT (GGSN to PCF)

The GGSN sends a COPS RPT message back to the PCF, and includes an acknowledgement and/or an error response to the DEC message.

17. GPRS: Create PDP Context Resp (GGSN to SGSN)

The GGSN checks its own available resources and if enough resources are available, it sends a Create PDP Context Response message back to SGSN containing the negotiated value of the UMTS QoS IE as defined in 3GPP TS 29.060.

18. GPRS: Active PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to UE containing the negotiated value of the UMTS QoS IE as defined in TS 24.008.

19. COMET (UE to P-CSCF) – see example in table 7.y.1-15

As the confirmation of the preconditions are requested in the 183 Session Progress response, when the UE finishes the QoS reservation for both the uplink and downlink direction, according to the GPRS procedures as indicated by the GPRS: Active PDP Context Accept message, it sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The COMET includes in the SDP the information about the successful QoS bi-directional assured mode, due to the successful bi-directional PDP context established.. The SDP indicates that the QoS resource reservation for both send and receive mode was successful from the terminating endpoint side.

30. COPS: DEC (PCF to GGSN)

When the P-CSCF receives the 200 OK response to the INVITE request, the PCF shall send a COPS DEC message to the GGSN to enable the use of the authorised QoS resources, i.e. to open the 'gate', and allow packet flow in both directions in accordance with the policy decision within the GGSN PEP.

31. COPS: RPT (GGSN to PCF)

The GGSN receives the COPS DEC message and enables the use of the authorised QoS resources, i.e. opens the 'gate' within the GGSN, and sends a COPS RPT message back to the PCF.

5.3.2 Mobile Termination, with Service-based Local Policy, without resource reservation protocol, only GPRS procedures

Figure 5.3.2-1 shows an example of the GPRS and the COPS interactions during a session setup when SBLP is being applied. Because the S-CSCF is not involved in GPRS interaction, it is not shown in the, but it is assumed that the S-CSCF is the next entity in the signalling flow.

This example is appropriate for a SIP QoS Assured session although only SBLP aspects are highlighted. It is assumed in this example that both the UAC and UAS have chosen to use the GPRS procedures to guarantee the QoS, which means both the UAC and UAS establish satisfactory PDP context on their respective accesses. It is assumed that the core network is DiffServ enabled and service based local policy (SBLP) decisions are taken by the PCF. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.

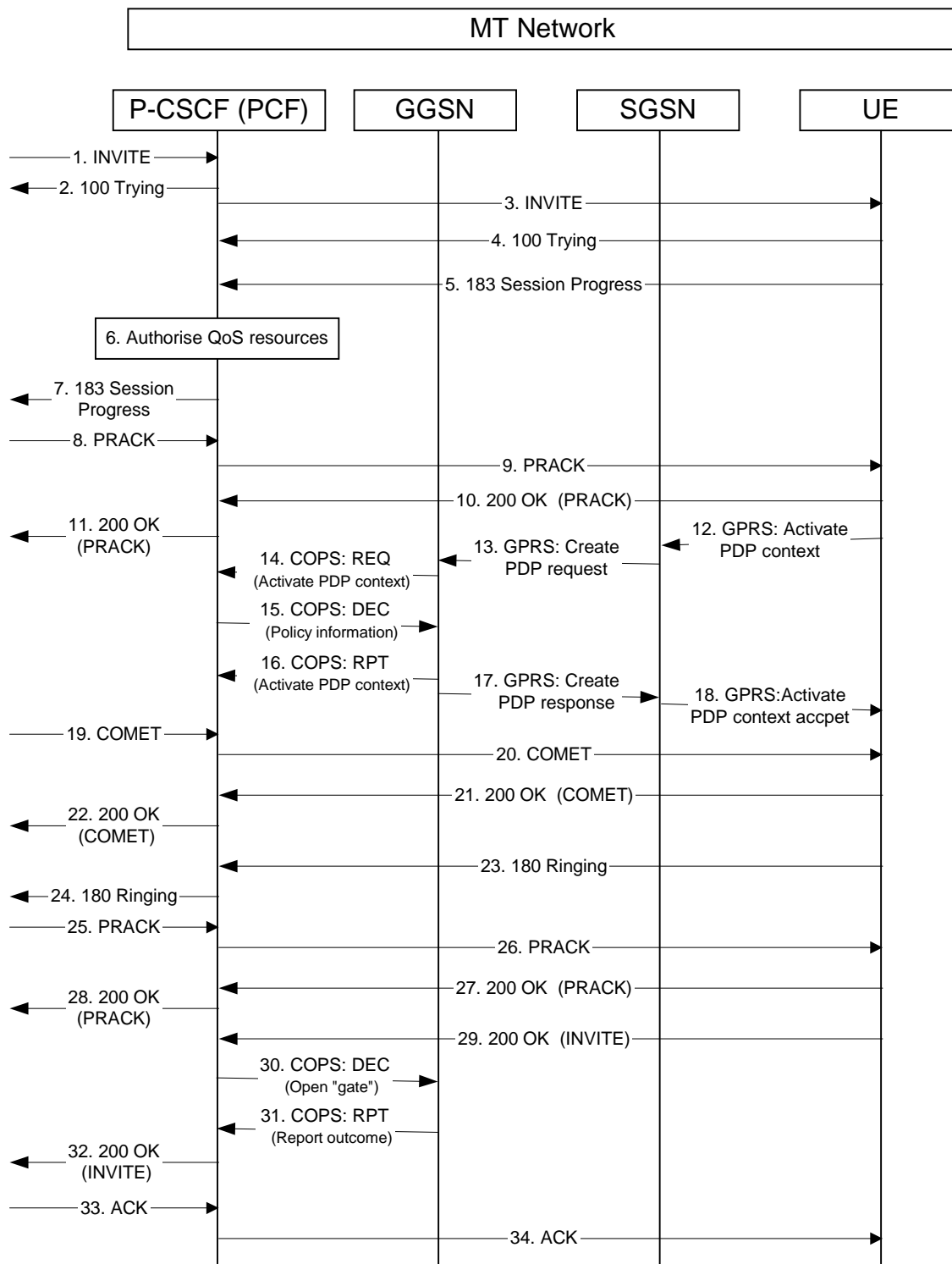


Figure 5.3.2-1 Interaction between SIP/SDP, GPRS and COPS, Mobile terminating side

Only the relevant SIP, GPRS and COPS messages are mentioned in this subclause. The complete SIP messages are detailed in subclause 7.4.2. The GPRS messages are detailed in 3GPP TS 24.008 and 3GPP TS 29.060. The COPS messages are detailed in 3GPP TS 29.207.

3. INVITE (P-CSCF to UE)

Upon receiving the INVITE, the PCF generates the media authorisation token; the P-CSCF obtains the token from the PCF and put it into the Media Authorization header in the INVITE and sends it to the UE.

5. 183 Session Progress (UE to P-CSCF)

UE sends the 183 Session Progress message back to P-CSCF with the accepted SDP.

6. Authorise QoS Resources

At the reception of the 183 Session Progress message at the P-CSCF, the P-CSCF authorizes the QoS resource needed for this session.

9. PRACK (P-CSCF to UE)

This PRACK carries the final SDP which will be used for this session. The P-CSCF forwards the PRACK to the UE.

12. GPRS: Active PDP Context (UE to SGSN)

The UE sends an Activate PDP Context message to the SGSN as defined in 3GPP TS 24.008. The UE associates the PDP context to the session by including the media authorisation token information and the flow identifier(s) information. The PDP Context is bi-directional.

Editors note: The encoding of the media authorisation token information and flow identifiers in the GPRS Active PDP Context message is for further study.

Editors note: The mapping of SDP to the UMTS QoS parameters is being considered within CN3.

Editor's Note: It shall be possible that PDP Context activation starts immediately after the reception of the PRACK message, to save the time for call setup.

13. GPRS: Create PDP Context (SGSN to GGSN)

The SGSN checks the user profile to authorise the requested QoS and also the available resource, if both are granted, it sends the corresponding Create PDP Context message to the GGSN as defined in 3GPP TS 29.060. This message contains the media authorisation token information and the flow identifier(s) information.

14. COPS: REQ (GGSN to PCF)

When the Create PDP Context message is received in the GGSN containing the media authorisation token information and the flow identifier(s) information, the PEP in the GGSN shall send a COPS REQ message to the PCF as described in 3GPP TS 29.207. The PCF verifies that the media authorisation token information and the associated flow identifier(s) information are as expected.

15. COPS: DEC (PCF to GGSN)

The PCF sends a COPS DEC message back to the GGSN.

Editors note: The contents of the COPS DEC message, and the interaction with the PEP is currently being considered within CN3.

16. COPS: RPT (GGSN to PCF)

The GGSN sends a COPS RPT message back to the PCF, and includes an acknowledgement and/or an error response to the DEC message.

17. GPRS: Create PDP Context Response (GGSN to SGSN)

The GGSN checks its own available resources and if enough resources are available, it sends a Create PDP Context Response message back to SGSN containing the negotiated value of the UMTS QoS IE as defined in 3GPP TS 29.060.

18. GPRS: Active PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to UE containing the negotiated value of the UMTS QoS IE as defined in 3GPP TS 24.008.

23. 180 Ringing (UE to P-CSCF)

As preconditions are requested within the INVITE request, the UE waits for two events to occur. Firstly, the GPRS resource reservation must complete successfully as indicated by the GPRS: Active PDP Context Accept. Secondly, the resource reservation initiated by the originating endpoint must complete successfully. This is indicated by the COMET request. The UE may now alert the subscriber of an incoming session attempt and send the 180 Ringing provisional response.

30. COPS: DEC (PCF to GGSN)

When the P-CSCF receives the 200 OK response to the INVITE request, the PCF shall send a COPS DEC message to the GGSN to enable the use of the authorised QoS resources, i.e., to open the 'gate', and allow packet flow in both directions in accordance with the policy decision within the GGSN PEP.

31. COPS: RPT (GGSN to PCF)

The GGSN receives the COPS DEC message and enables the use of the authorised QoS resources, i.e., opens the 'gate' within the GGSN, and sends a COPS RPT message back to the PCF.

5.3.3 Mobile originated QoS assured sessions and coordination with GPRS bearer level

Figure 5.3.3-1 shows an example of a SIP QoS Assured session. Because the S-CSCF is not involved in the GPRS interaction, it is not shown in the flow, but it is assumed that the S-CSCF or I-CSCF is the next entity in the signalling flow.

It is assumed in this example that both the UAC and UAS have chosen to use the GPRS procedures to guarantee the QoS, which means both the UAC and UAS establish satisfactory PDP context on their respective accesses. It is further assumed that the core network is DiffServ enabled. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.

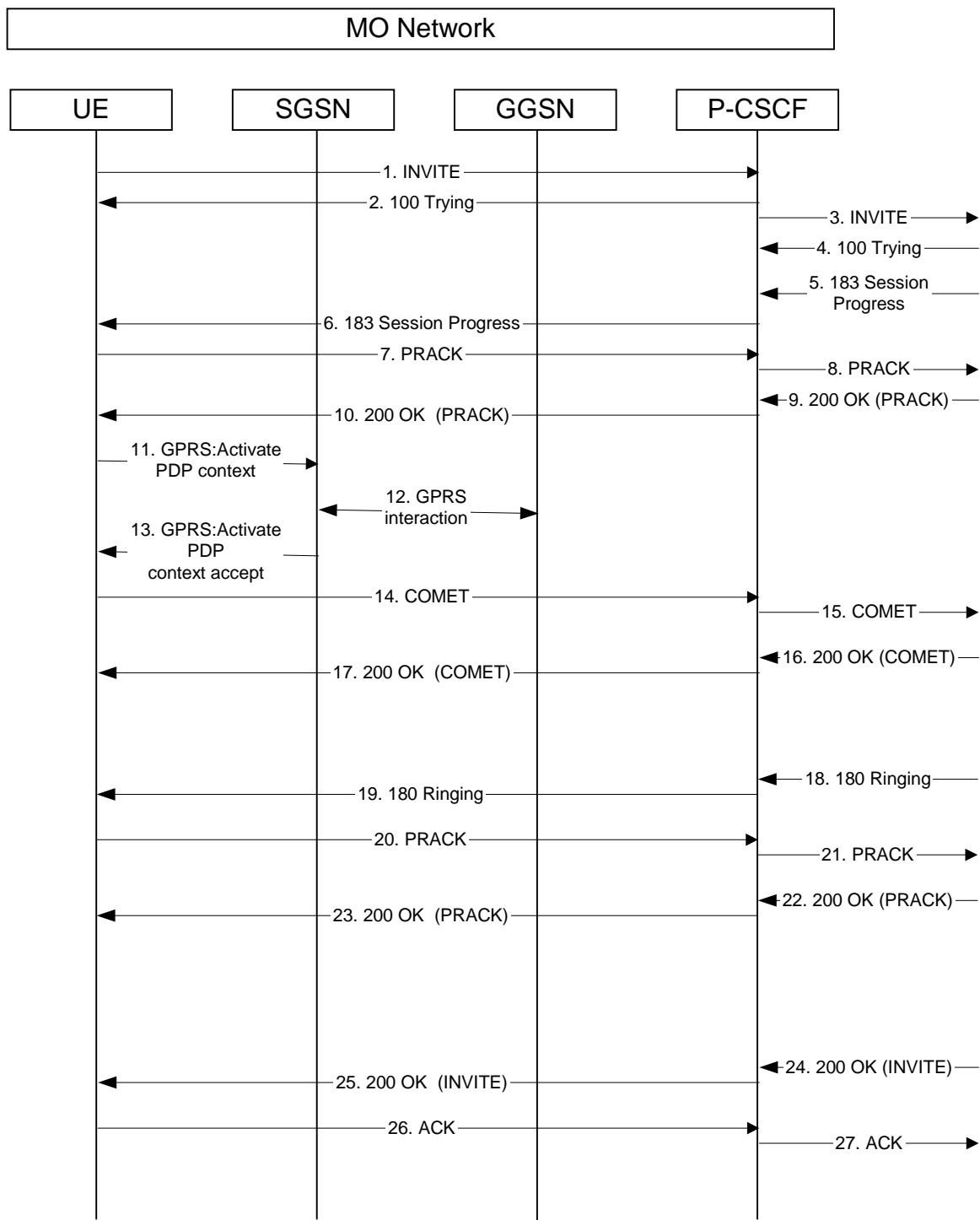


Figure 5.3.3-1: Interaction between SIP/SDP and GPRS, mobile originating side

Only the relevant SIP and GPRS messages are mentioned in this subclause. The complete SIP messages are detailed in subclause 7.2.2. The GPRS messages are detailed in 3GPP TS 24.008 and 3GPP TS 29.060.

1. INVITE (UE to P-CSCF)

The UE (UAC - the session originator) sends the INVITE request, containing an initial SDP, to the P-CSCF. The SDP contains the set of codecs supported by the UE and includes the entry "a=qos:mandatory sendrecv". The UE also requests to establish preconditions in QoS Assured mode for all the media streams, but it does not request confirmation of the establishment of the QoS preconditions from the terminating side (UAS).

6. 183 Session Progress (P-CSCF to UE)

The P-CSCF forwards the 183 Session Progress response from the UAS to the originating endpoint. The SDP contains the set of codecs supported by the UAS and includes the entry "a=qos:mandatory sendrecv confirm". UAS supports the preconditions and requests that UAC sends a confirmation when the preconditions are met.

11. GPRS: Activate PDP Context (UE to SGSN)

The UE sends an Activate PDP Context message to the SGSN with the UMTS QoS parameters. The PDP context is bidirectional.

Editor's Note: The mapping of SDP to the UMTS QoS parameters is being considered within CN3.

12. GPRS interaction

The GPRS interaction procedures to create a PDP context are specified in 3GPP TS 29.060.

13. GPRS: Activate PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to the UE.

Editor's Note: It is also possible that PDP Context activation starts immediately after the reception of the 183 Session Progress, to save the time for call setup.

14. COMET (UE to P-CSCF)

When the UE finishes the QoS reservation for both the uplink and downlink direction, according to the GPRS procedures, it sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The COMET includes in the SDP the information about the successful QoS bidirectional assured mode, due to the successful bidirectional PDP context established and includes the entry "a=qos: success sendrecv". The request is sent first to the P-CSCF.

25. 200 OK (P-CSCF to UE)

P-CSCF forwards the 200 OK final response to the session originator. The SDP contains an indication that the UE successfully reserved the QoS in the send and receive directions (SDP with a=qos:success sendrecv line).

5.3.4 Mobile Terminated QoS assured sessions and coordination with GPRS bearer level

Figure 5.3.4-1 shows an example of a SIP QoS Assured session. Because the S-CSCF is not involved in the GPRS interaction, it is not shown in the flow, but it is assumed that the S-CSCF is the next entity in the signalling flow.

It is assumed in this example that both the UAC and UAS have chosen to use the GPRS procedures to guarantee the QoS, which means both the UAC and UAS establish satisfactory PDP context on their respective accesses. It is further assumed that the core network is DiffServ enabled. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.

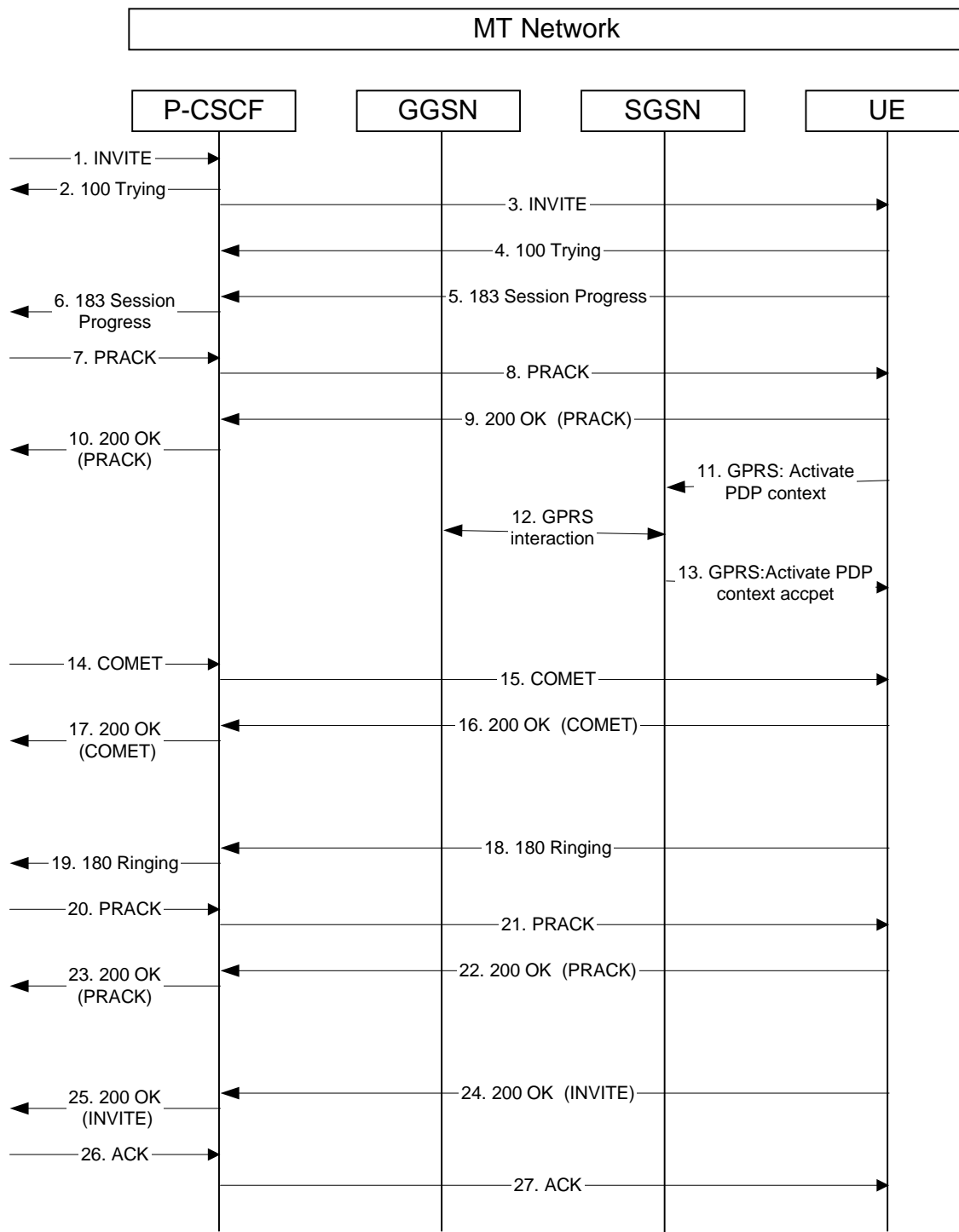


Figure 5.3.4-1: Interaction between SIP/SDP and GPRS, mobile terminating side

Only the relevant SIP and GPRS messages are mentioned in this subclause. The complete SIP messages are detailed in subclause 7.4.2. The GPRS messages are detailed in 3GPP TS 24.008 and 3GPP TS 29.060.

3. INVITE (P-CSCF to UE)

The P-CSCF forwards the INVITE request, containing an initial SDP, to the terminating UE (UAS). The SDP contains the set of codecs and includes the entry "a=qos:mandatory sendrecv" supported by the originating UE (UAC). The UAC also requests to establish preconditions in QoS Assured mode for all the media streams, but it does not request confirmation of the establishment of the QoS preconditions from the terminating side (UAS).

5. 183 Session Progress (UE to P-CSCF)

The UAS determines the complete set of codecs that it is capable and willing of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE request. The UAS responds with a 183 Session Progress response and sends this to the P-CSCF. The SDP contains the set of codecs supported by the UAS and includes the entry "a=qos:mandatory sendrecv confirm". UAS supports the preconditions and requests that UAC sends a confirmation when the preconditions are met.

11. GPRS: Activate PDP Context (UE to SGSN)

The UE sends an Activate PDP Context message to the SGSN with the UMTS QoS parameters.

Editor's Note: The mapping of SDP to the UMTS QoS parameters is being considered within CN3.

12. GPRS: interaction

The GPRS interaction procedures to create a PDP context are specified in 3GPP TS 29.060.

13. GPRS: Active PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to the UE.

Editor's Note: It is also possible that PDP Context activation starts immediately after the reception of the PRACK for the 183 Session Progress, to save the time for call setup.

15. COMET (P-CSCF to UE)

P-CSCF forwards the COMET request to the UE. The COMET includes in the SDP the information about the successful QoS bidirectional assured mode, due to the successful bidirectional PDP context established and includes the entry "a=qos: success sendrecv".

18. 180 Ringing (UE to P-CSCF)

Before proceeding with session establishment, the UE waits for two events. First, the GPRS resource reservation must complete successfully. Second, the resource reservation initiated by the originating endpoint must complete successfully (which is indicated by the COMET request). The UE may now immediately accept the session (and proceed with step #24), or alert the destination subscriber of an incoming session attempt; if the latter it indicates this to the calling party by a 180 Ringing provisional response sent to P-CSCF.

24. 200 OK (UE to P-CSCF)

When the called party answers, the terminating UE sends a 200 OK final response to the INVITE request to P-CSCF, and starts the media flow(s) for this session. The SDP contains an indication that the UE successfully reserved the QoS in the send and receive directions (SDP with a=qos:success sendrecv line).

5.3.5 P-CSCF Functionalities in End-to-End QoS and Signalling Mobile Originating Interactions with service-based local policy

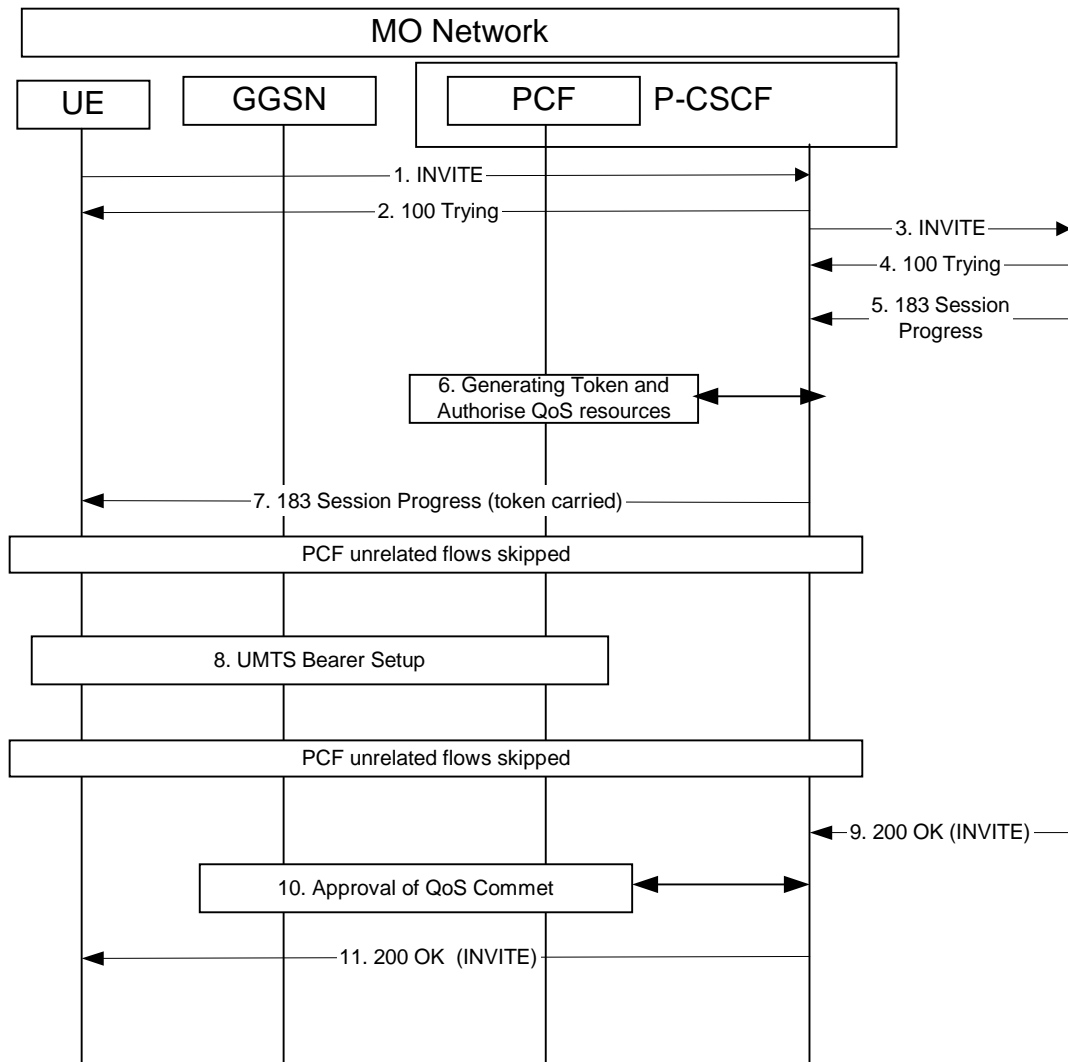


Figure 5.3.5-1: Interaction between P-CSCF and PCF, Mobile originating side

6. PCF Generates Token and Authorise QoS Resource

The Authorize QoS Resources procedure is triggered by the P-CSCF receiving a 183 message. Based on the SDP information from INVITE and 183 messages, the PCF has sufficient information about this session, such as the end-points, bandwidth requirements, and the characteristics of the media exchange.

The PCF shall authorize the required QoS resources for the session and install the IP bearer level policy based on information from the P-CSCF. In order to ensure that the IP bearer flow correlates to the one approved during the SIP session establishment, the SIP extensions for media authorization proposed in IETF shall be used.

Based on local policy, QoS resources may also be enabled at the time they are authorised by the PCF.

The Authorization-Token is generated by the PCF and sent to the UE.

7. 183 Session Progress (P-CSCF to UE)

This message shall contain the Media Authorisation header, which holds the Media Authorisation Token. Upon receipt of the Media Authorisation Token, the UE generates a flow identifier which identifies an IP media flow associated with the SIP session. The Flow Identifiers are based on the sequence of media flows in the SDP. A Flow Identifier combined with the Authorization Token shall be sufficient to uniquely identify an IP media flow.

8. UMTS Bearer Setup

UE uses that token to activate PDP Context from GGSN network. The PCF makes final decision to enforce GGSN network to accept or reject PDP Context activation based service based local policy.

10. Approval of QoS Commit

The Approval of QoS Commit procedure is triggered by the P-CSCF receiving a 200 OK message. The PCF will interact with GGSN network to open the "gate" for the IP bearer.

5.3.6 P-CSCF Functionalities in End-to-End QoS and Signalling Mobile Terminating Interactions with service-based local policy

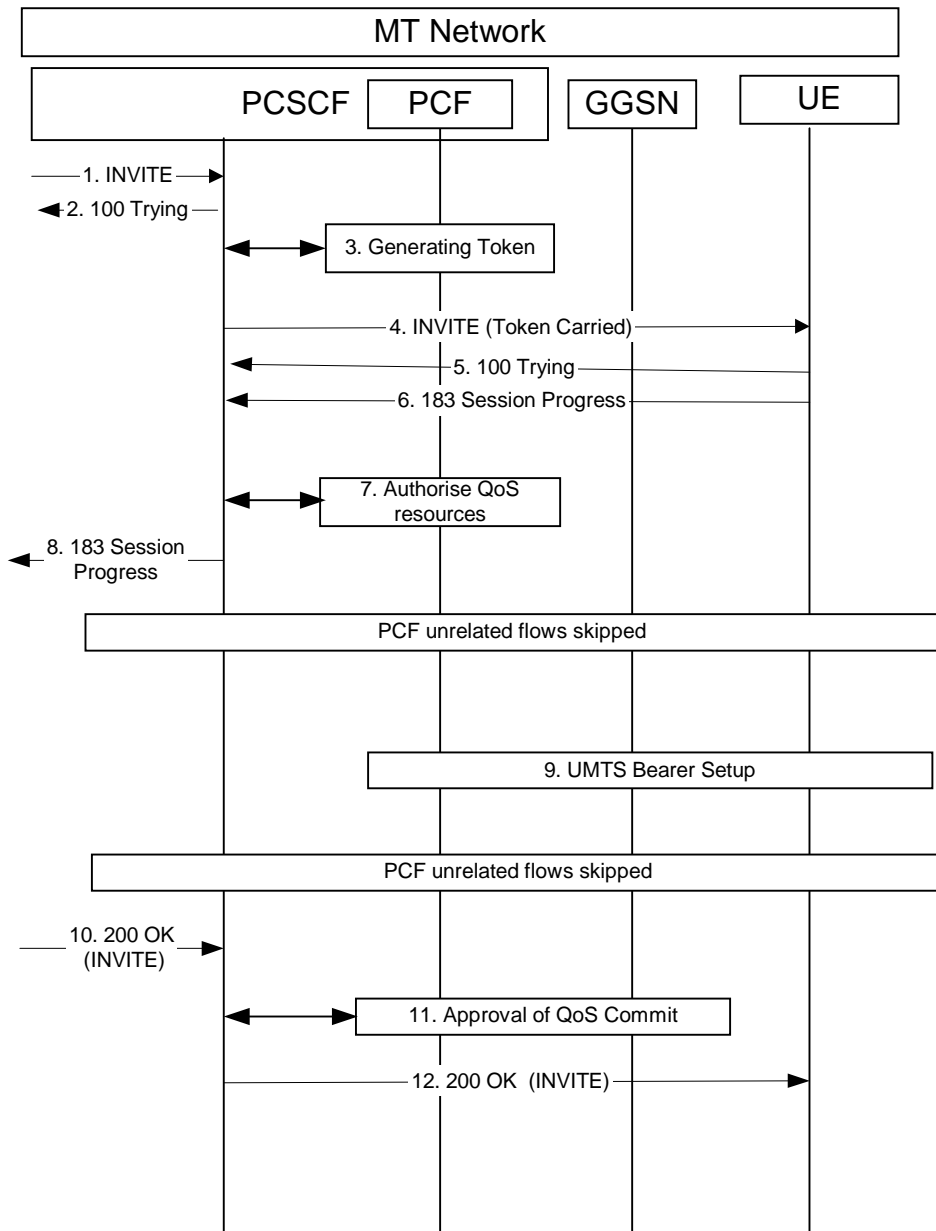


Figure 5.3.6-1: Interaction between P-CSCF and PCF, Mobile terminating side

3. Token Generation

Based on the information got from the P-CSCF, the PCF generates an authorization token. Since PCF has not receive all the information about end points yet, so QoS resource has not been authorized.

4. INVITE (P-CSCF to UE)

This message shall contain the Media Authorisation header, which holds the Media Authorisation Token.

7. QoS Authorization

The Authorize QoS Resources procedure is triggered by the P-CSCF receiving a 183 message. Based on the SDP information from INVITE and 183 messages, the PCF has sufficient information about this session, such as the end-points, bandwidth requirements, and the characteristics of the media exchange.

The PCF shall authorize the required QoS resources for the session and install the IP bearer level policy based on information from the P-CSCF. In order to ensure that the IP bearer flow correlates to the one approved during the SIP session establishment, the SIP extensions for media authorization proposed in IETF shall be used.

Based on local policy, QoS resources may also be enabled at the time they are authorised by the PCF.

8. 183 Session Progress (P-CSCF to UE)

Upon receipt of this message, the UE generates a flow identifier which identifies an IP media flow associated with the SIP session. The Flow Identifiers are based on the sequence of media flows in the SDP. A Flow Identifier combined with the Authorization Token shall be sufficient to uniquely identify an IP media flow.

9. UMTS Bearer Setup

UE uses that token to activate PDP Context from GGSN network. The PCF makes final decision to enforce GGSN network to accept or reject PDP Context activation based service based local policy.

11. Approval of QoS Commit

The Approval of QoS Commit procedure is triggered by the P-CSCF receiving a 200 OK message. The PCF will interact with GGSN network to open the "gate" for the IP bearer.

6 Signalling flows for REGISTER (non hiding)

6.1 Introduction

In IMS Authentication is performed at registration time. The following sections show examples of SIP registration and UMTS AKA authentication. It is possible for the home to require other types of authentication.

In the example below, Extensible Authentication Protocol (EAP) is used within SIP headers to carry the information related to the authentication-challenge and response.

6.2 Registration signalling: user not registered

Figure 6.2-1 shows the registration signalling flow for the scenario when the user is not registered. For the purpose of this registration signalling flow, the subscriber is considered to be roaming. This flow also shows the authentication of the private user identity. In this signalling flow, the home network does not have network configuration hiding active.

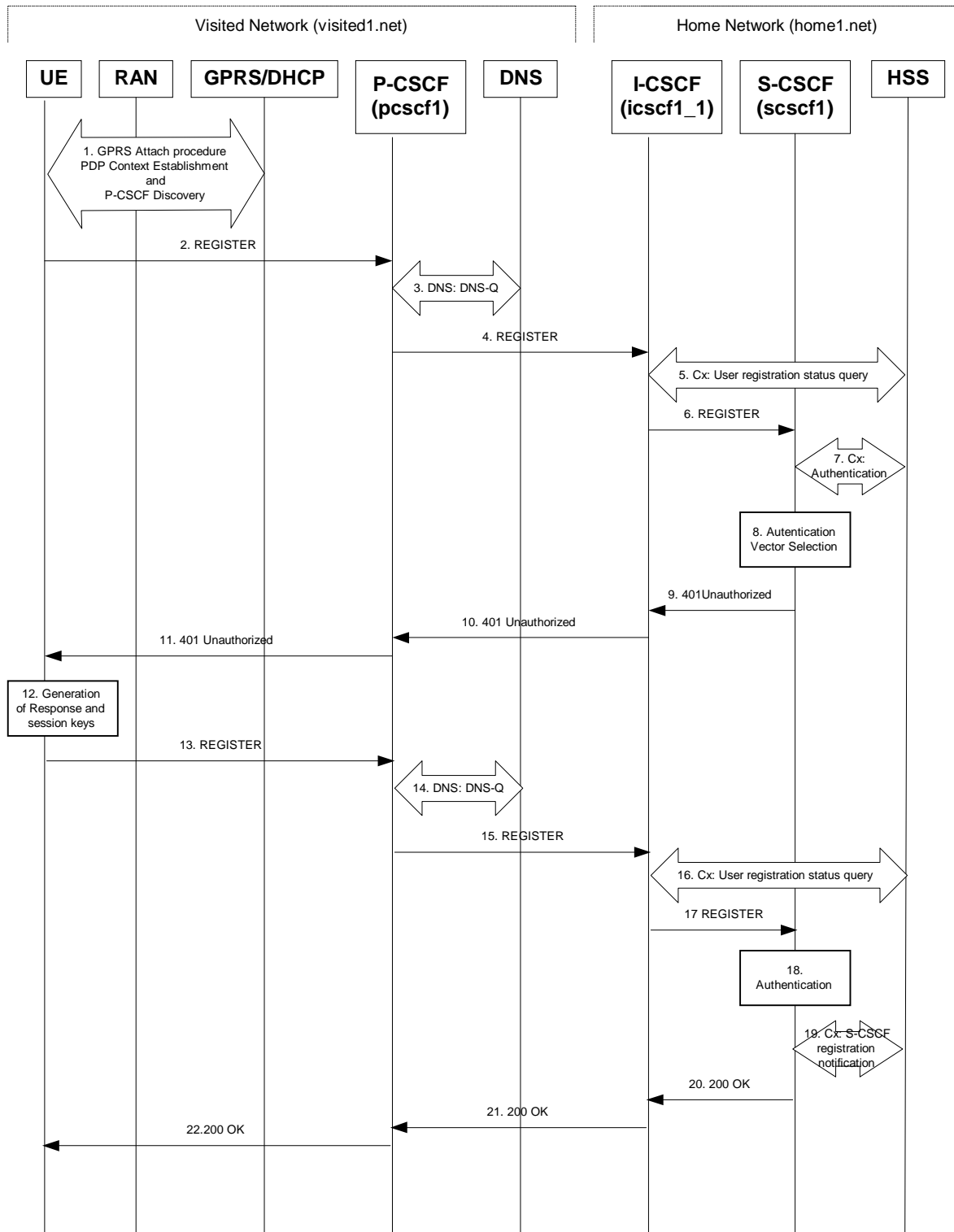


Figure 6.2-1: Registration signalling: user not registered

1. GPRS Attach / PDP Context Establishment and P-CSCF Discovery (UE to GPRS)

This signalling flow is shown to indicate prerequisites for the registration signalling.

See subclause 5.2 for details.

2. REGISTER request (UE to P-CSCF) – see example in table 6.2-2

The purpose of this request is to register the user's SIP URI with a S-CSCF in the home network. This request is routed to the P-CSCF because it is the only SIP server known to the UE. In the following SIP request, the Contact field contains the user's host address.

The P-CSCF will perform two actions, binding and forwarding. The binding is between the User's SIP address (user1_public1@home1.net) and the host (terminal) address ([5555::aaa:bbb:ccc:ddd]) which was acquired during PDP context activation process.

[Editor's note: The security mode set-up procedure supports the negotiation of different protection mechanisms. This will involve the addition of a "security-setup" field to the SIP REGISTER request and the REGISTER response performing the authentication challenge containing the parameters:

- list of Authentication (integrity) algorithms, and optionally list of encryption (confidentiality) algorithms
- SA-ID that is used to uniquely identify the SA at the receiving side.
- Key length: the length of encryption and authentication (integrity) keys is 128 bits.

The exact format and use for the security mode setup is being worked through IETF and is FFS]

Table 6.2-2: REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Call-ID: apb03a0s09dkjdfglkj49111
Authorization: eap eap-p=base64(user1_private1@home1.net)
CSeq: 1 REGISTER
Expires: 7200
Content-Length: 0
```

Request-URI: The Request-URI (the URI that follows the method name, "REGISTER", in the first line) indicates the destination domain of this REGISTER request. The rules for routing a SIP request describe how to use DNS to resolve this domain name ("home1.net") into an address or entry point into the home operator's network (the I-CSCF). This information is stored in the USIM.

Via: IPv6 address of the SIP session allocated during the PDP Context Activation process.

From: This indicates the public user identity originating the REGISTER request. The public user identity may be obtained from the USIM.

To: This indicates the public user identity being registered. This is the identity by which other parties know this subscriber. It may be obtained from the USIM.

Contact: This indicates the point-of-presence for the subscriber - the IP address of the UE. This is the temporary point of contact for the subscriber that is being registered. Subsequent requests destined for this subscriber will be sent to this address. This information is stored in the P-CSCF and S-CSCF.

Authorization: It carries authentication information. The private user identity (user1_private1@home1.net) is carried in the user ID field of the extensible authentication protocol (EAP).

NOTE: The actual Authorization header value may look like this as it is in base64 form:
Authorization: eap eap-p=QWxhZGRpbjpvGVuIHNIc2FtZQ==

Upon receiving this request the P-CSCF will set it's SIP registration timer for this UE to the Expires time in this request.

3. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol, the P-CSCF selects the UDP.

Table 6.2-3a: DNS: DNS Query (P-CSCF to DNS)

```
-----
OPCODE=SQQUERY
QNAME=_sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
-----
```

The DNS records are retrieved according to RFC 2782 [4].

Table 6.2-3b: DNS Query Response (DNS to P-CSCF)

```
-----
OPCODE=SQQUERY, RESPONSE, AA
QNAME=_sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip._udp.registrar.home1.net      0 IN SRV 1 10 5060 icscf1_p.home1.net
                                   0 IN SRV 1  0 5060 icscf7_p.home1.net

icscf1_p.home1.net                 0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                 0 IN AAAA      5555::a1a:b2b:c3c:d4d
-----
```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

4. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.2-4

The P-CSCF needs to be in the path for all mobile originated and mobile terminated requests for this user. To ensure this, the P-CSCF adds itself to the Path header value for future requests.

The P-CSCF binds the public user identity under registration to the Contact header supplied by the user.

The P-CSCF adds also the Roaming-Info header (if not present). The P-CSCF adds the *vnid* parameter with the contents of the identifier of the P-CSCF network. This may be the visited network domain name or any other identifier that identifies the visited network at the home network.

This signalling flow shows the REGISTER request being forward from the P-CSCF to the I-CSCF in the home domain.

Table 6.2-4: REGISTER request (P-CSCF to I-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pscfl.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Require:/Proxy-Require: These headers are included to ensure that the recipient correctly handles the Path header. If the recipient does not support the path header, a response will be received with a status code of 420 and an Unsupported header indicating "path". Such a response indicates a misconfiguration of the routing tables and the request has been routed outside the IM CN subsystem.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

5. Cx: User registration status query procedure

The I-CSCF makes a request for information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. The HSS returns the S-CSCF required capabilities and the I-CSCF uses this information to select a suitable S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-5a provides the parameters in the REGISTER request (flow 4) which are sent to the HSS.

Table 6.2-5a Cx: User registration status query procedure (I-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
I-CSCF to HSS	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol.
	Public User Identity	To:	Identity which is used to communicate with other users
	Visited Network Identifier	Roaming Info: vnid	This information indicates the network identifier of the visited network

6. REGISTER request (I-CSCF to S-CSCF) – see example in table 6.2-6

I-CSCF does not modify the Path header.

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 6.2-6: REGISTER request (I-CSCF to S-CSCF)

```

REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

Upon receiving this request the S-CSCF may set its SIP registration timer for this UE to the Expires time in this request or the S-CSCF may assign another registration timer for this registration

7. Cx: Authentication procedure

On receiving a REGISTER request from an unauthenticated user, the S-CSCF requires at least one authentication vector to be used in the challenge to the user. If a valid AV is not available, then the S-CSCF requests at least one AV from the HSS.

The S-CSCF indicates to the HSS that it has been assigned to serve this user.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-7a provides the parameters in the REGISTER request (flow 6) which are sent to the HSS.

Table 6.2-7a Cx: S-CSCF authentication information procedure (S-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
S-CSCF to HSS	Public User Identify	To:	Identity which is used to communicate with other users
	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol.
	S-CSCF Name	Request-URI:	This information element contains the name of the S-CSCF. The presence of this IE indicates that the user has not been authenticated yet by the S-CSCF

8. Authentication vector selection

The S-CSCF selects an authentication vector for use in the authentication challenge. For detailed description of the authentication vector, see 3GPP TS 33.203.

NOTE 1: The authentication vector may be of the form as in 3GPP TS 33.203 (if IMS AKA is the selected authentication scheme):

- AV = RAND_n||AUTN_n||XRES_n||CK_n||IK_n where:
 - RAND: random number used to generate the XRES, CK, IK, and part of the AUTN. It is also used to generate the RES at the UE.
 - AUTN: Authentication token (including MAC and SQN).
 - XRES: Expected (correct) result from the UE.
 - CK: Cipher key (optional).
 - IK: Integrity key.

9. 401 Unauthorized response (S-CSCF to I-CSCF) - see example in table 6.2-9

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.2-9: 401 Unauthorized response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscfl_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscfl.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID: apb03a0s09dkjdfg1kj49111
WWW-Authenticate: eap eap-p=base64(user1_privatel@home1.net, RAND, AUTN)
CSeq: 1 REGISTER
Content-Length: 0
```

NOTE 2: The actual WWW-Authenticate header value may look like this as it is in base64 form:
WWW-Authenticate: eap eap-p=QWxh4ZGRpb2jpcvGVuNlctZQ==

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

10. 401 Unauthorized response (I-CSCF to P-CSCF) - see example in table 6.2-10

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.2-10: 401 Unauthorized response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcscfl.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

11. 401 Unauthorized response (P-CSCF to UE) - see example in table 6.2-11

The P-CSCF removes any keys received in the 401 Unauthorized response and forwards the rest of the response to the UE.

Table 6.2-11: 401 Unauthorized response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_privatel.home1.net, RAND, AUTN)
CSeq:
Content-Length:
```

12. Generation of response and session keys at UE

Upon receiving the Unauthorised response, the UE extracts the MAC and the SQN from the AUTN. The UE calculates the XMAC and checks that XMAC matches the received MAC and that the SQN is in the correct range. If both these checks are successful the UE calculates the response, RES, and also computes the session keys IK and CK. The RES is put into the Authorization header and sent back to the registrar in the REGISTER request.

13. REGISTER request (UE to P-CSCF) - see example in table 6.2-13**Table 6.2-13 REGISTER request (UE to P-CSCF)**

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49112
Authorization: eap eap-p=base64(user1_privatel@home1.net, RES)
CSeq: 2 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 11 along with the private user identity both encoded in base64 format.

14. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 6.2-14a DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC 2782 [4].

Table 6.2-14b DNS Query Response (DNS to P-CSCF)

```
OPCODE=SQUERY, RESPONSE, AA
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip._udp.registrar.home1.net      0 IN SRV 1 10 5060 icscf1_p.home1.net
                                   0 IN SRV 1 0 5060 icscf7_p.home1.net

icscf1_p.home1.net                0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                0 IN AAAA      5555::ala:b2b:c3c:d4d
```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

15. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.2-15

This signalling flow shows the REGISTER request being forwarded from the P-CSCF to the I-CSCF in the home domain.

Table 6.2-15 REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

16. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. The HSS returns the S-CSCF name which was previously selected in step 5 (Cx: User registration status query procedure).

For detailed message flows see 3GPP TS 29.228.

Table 6.2-16a provides the parameters in the REGISTER request (flow 15), which are sent to the HSS.

Table 6.2-16a Cx: User registration status query procedure (I-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
I-CSCF to HSS	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol.
	Public User Identity	To:	Identity which is used to communicate with other users
	Visited Network Identifier	Roaming-Info: vnid	This information indicates the network identifier of the visited network

17. REGISTER request (I-CSCF to S-CSCF) - see example in table 6.2-17

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF.

Table 6.2-17: REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

18. Authentication

Upon receiving the REGISTER request carrying the authentication response, RES, the S-CSCF checks that the user's active, XRES matches the received RES. If the check is successful then the user has been authenticated and the public user identity is registered in the S-CSCF.

19. Cx: S-CSCF registration notification procedure

On registering a user the S-CSCF informs the HSS that the user has been registered at this instance. Upon being requested by the S-CSCF, the HSS will also include the user profile in the response sent to the S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-19a provides the parameters in the REGISTER request (flow 17), which are sent to the HSS.

Table 6.2-19a Cx: S-CSCF registration notification procedure (S-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
S-CSCF to HSS	Public User Identity	To:	Identity which is used to communicate with other users
	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol. Unique identity in IMS which is used by network to authenticate this user
	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

20. 200 OK response (S-CSCF to I-CSCF) - see example in table 6.2-20

The S-CSCF sends acknowledgement to the I-CSCF indicating that Registration was successful.

Table 6.2-20: 200 OK response (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact: sip:[5555::aaa:bbb:ccc:ddd]
CSeq:
Date: Wed, 11 July 2001 08:49:37 GMT
Expires: 7200
Content-Length:
```

Path: The S-CSCF inserts its own name to the front of the list.

21. 200 OK response (I-CSCF to P-CSCF) - see example in table 6.2-21

The I-CSCF forwards acknowledgement from the S-CSCF to the P-CSCF indicating that Registration was successful.

Table 6.2-21: 200 OK response (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

22. 200 OK response (P-CSCF to UE) - see example in table 6.2-22

The P-CSCF removes its address from the Path header, reverses the order of the fields, saves the resulting Path header and associates it with the UE. The P-CSCF then removes the Path header from the 200 OK response. The P-CSCF then forwards acknowledgement from the I-CSCF to the UE indicating that Registration was successful.

Table 6.2-22: 200 OK response (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

6.3 Registration signalling: reregistration - user currently registered

For the purpose of the reregistration signalling flow shown in figure 6.3-1, the subscriber is considered to be roaming. The HSS information indicates that the subscriber is registered and authenticated, and that the S-CSCF has been allocated to this subscriber. In this signalling flow, the home network does not have network configuration hiding active. This flow also shows the authentication of the private user identity.

This signalling flow assumes:

1. That the same PDP Context allocated during the initial registration scenario is still used for reregistration. For the case when the UE does not still have an active PDP context then PDP context procedures from subclause 16.2 is completed first.

Editor's Note: If the same PDP-Context is not available, is it guaranteed that the UE will get back the same IP address at this point? If this is not possible, would there be a problem with the binding in the P-CSCF (user_public1@home1.net and [5555::aaa:bbb:ccc:ddd])?

2. The DHCP procedure employed for P-CSCF discovery is not needed.
3. The S-CSCF selection procedure invoked by the I-CSCF is not needed.

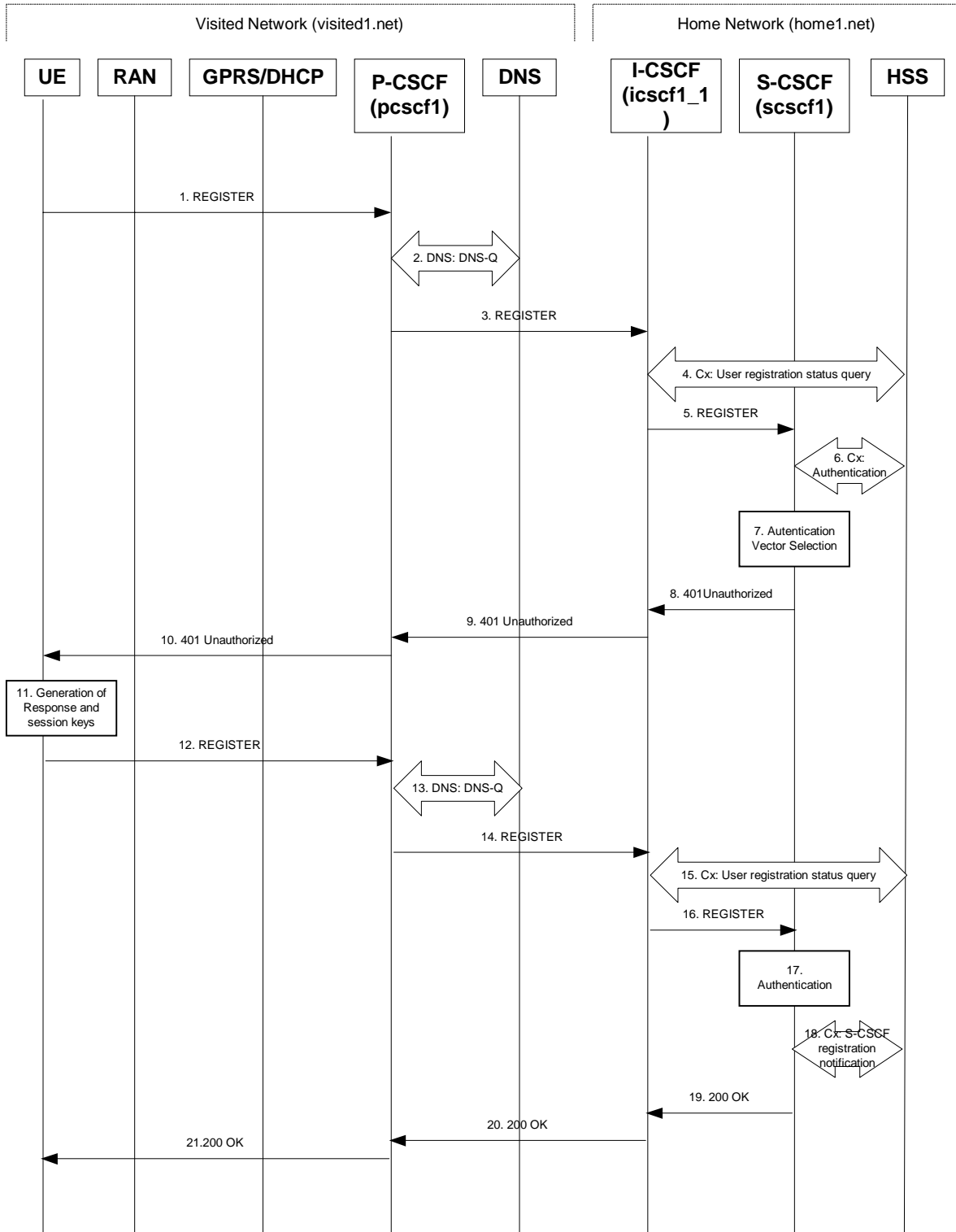


Figure 6.3-1: Reregistration when UE roaming

1. REGISTER request (UE to P-CSCF) - see example in table 6.3-1

The registration expires in the UE. The UE reregisters by sending a new REGISTER request. This request is sent to the same P-CSCF with which the UE initially registered. The P-CSCF maintains the same binding between the public user address (user1_public1@home1.net) and the host (terminal) address ([5555::aaa:bbb:ccc:ddd]) which it established during the original registration.

Table 6.3-1: REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Call-ID: apb03a0s09dkjdfglkj49111
Authorization: eap eap-p=base64(user1_private1@home1.net)
CSeq: 3 REGISTER
Expires: 7200
Content-Length: 0
```

The header field usage is the same as for the initial registration scenario:

- From:** This indicates the public user identity originating the REGISTER request. The public user identity may be obtained from the USIM.
- To:** This indicates public user identity being registered. This is the identity by which other parties know this subscriber.
- Contact:** This indicates the point-of-presence for the subscriber – the IP address of the UE. This is the temporary identifier for the subscriber that is being registered. Subsequent requests destined for this subscriber will be sent to this address. This information is stored in the P-CSCF and the S-CSCF.
- Authorization:** It carries authentication information. The private user identity (user1_private1@home1.net) is carried in the user ID field of the extensible authentication protocol (EAP).

NOTE 1: The actual Authorization header value may look like this as it is in base64 form:

```
Authorization: eap eap-p=QWxhZGRpbjpvGVuIHNlc2FtZQ==
```

- Request-URI:** The Request-URI (the URI that follows the method name, "REGISTER", in the first line) indicates the destination domain of this REGISTER request. The rules for routing a SIP request describe how to use DNS to resolve this domain name ("home1.net") into an address or entry point into the home operator's network (the I-CSCF). This information is stored in the USIM.

Upon receiving this request the P-CSCF will detect that it already has a registration record for this UE and will reset its SIP registration timer for this UE to the Expires time in this request.

2. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI. The DNS provides the P-CSCF with an address of the I-CSCF in the home network. The P-CSCF must not use the I-CSCF address cached as a result of the previous registration.

3. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.3-3

This signalling flow shows the REGISTER request being forward from the P-CSCF to the I-CSCF in the home domain.

Table 6.3-3 REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Require:/Proxy-Require: These headers are included to ensure that the recipient correctly handles the Path header. If the recipient does not support the path header, a response will be received with a status code of 420 and an Unsupported header indicating "path". Such a response indicates a misconfiguration of the routing tables and the request has been routed outside the IM CN subsystem.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

4. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. Because the user has registered, the HSS returns the I-CSCF with the S-CSCF address for the subscriber.

For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 3) which need to be sent to HSS, see table 6.2-5a.

Table 6.3-4a provides the parameters in the REGISTER request (flow 5), which are obtained from the information sent back from the HSS.

Table 6.3-4a Cx: User registration status query procedure (HSS to I-CSCF)

Message source & destination	Cx Information element name	Mapping to SIP header in REGISTER	Description
HSS to I-CSCF	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

5. REGISTER request (I-CSCF to S-CSCF) - see example in table 6.3-5

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected. The Request-URI is changed to the address of the S-CSCF.

Table 6.3-5: REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming_Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

Upon receiving this request the S-CSCF will detect that it already has a registration record for this UE and will reset it's SIP registration timer for this UE to the Expires time in this request.

6. Cx: Authentication procedure

On receiving a REGISTER request from a registered user, the S-CSCF requires at least one authentication vector to be used in the challenge to the user. If a valid AV is not available, then the S-CSCF requests at least one AV from the HSS.

For detailed message flows see 3GPP TS 29.228.

Table 6.3-6a provides the parameters in the REGISTER request (flow 5) which need to be sent to HSS.

Table 6.3-6a Cx: S-CSCF authentication information procedure (S-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
S-CSCF to HSS	Public User Identity	To:	Identity which is used to communicate with other users
	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol.
	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

7. Authentication vector selection

The S-CSCF selects an authentication vector for use in the authentication challenge. For detailed description of the authentication vector, see 3GPP TS 33.203.

NOTE 2: The authentication vector may be of the form as in 3GPP TS 33.203 (if IMS AKA is the selected authentication scheme):

- AV = RAND_n||AUTN_n||XRES_n||CK_n||IK_n where:
 - RAND: random number used to generate the XRES, CK, IK, and part of the AUTN. It is also used to generate the RES at the UE.
 - AUTN: Authentication token (including MAC and SQN).
 - XRES: Expected (correct) result from the UE.
 - CK: Cipher key (optional).
 - IK: Integrity key.

8. 401 Unauthorized response (S-CSCF to I-CSCF) - see example in table 6.3-8

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.3-8: 401 Unauthorized response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49111
WWW-Authenticate: eap eap-p=base64(user1_privat1@home1.net, RAND, AUTN)
CSeq: 1 REGISTER
Expires: 7200
Content-Length: 0
```

NOTE 3: The actual WWW-Authenticate header value may look like this as it is in base64 form:
WWW-Authenticate: eap eap-p=QWxh4ZGRpb2jpvGVuNlctZQ==

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

9. 401 Unauthorized response (I-CSCF to P-CSCF) - see example in table 6.3-9

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.3-9: 401 Unauthorized response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcsf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
WWW-Authenticate:
CSeq:
Expires:
Content-Length:
```

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS

10. 401 Unauthorized response (P-CSCF to UE) - see example in table 6.3-10

The P-CSCF removes any keys received in the 401 Unauthorized response and forwards the rest of the response to the UE.

Table 6.3-10: 401 Unauthorized response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_privatel.home1.net, RAND, AUTN)
CSeq:
Expires:
Content-Length:
```

11. Generation of response and session keys at UE

Upon receiving the Unauthorised response, the UE extracts the MAC and the SQN from the AUTN. The UE calculates the XMAC and checks that XMAC matches the received MAC and that the SQN is in the correct range. If both these checks are successful the UE calculates the response, RES, and also computes the session keys IK and CK. The RES is put into the Authorization header and sent back to the registrar in a REGISTER request.

12. REGISTER request (UE to P-CSCF) - see example in table 6.3-12

Table 6.3-12: REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49112
Authorization: eap eap-p=base64(user1_privatel@home1.net, RES)
CSeq: 4 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 10 along with the private user identity both encoded in base64 format.

13. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 6.3-13a: DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC 2782 [4].

Table 6.3-13b: DNS Query Response (DNS to P-CSCF)

```
OPCODE=SQUERY, RESPONSE, AA
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip._udp.registrar.home1.net      0 IN SRV 1 10 5060 icscf1_p.home1.net
                                   0 IN SRV 1  0 5060 icscf7_p.home1.net

icscf1_p.home1.net                 0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                 0 IN AAAA      5555::a1a:b2b:c3c:d4d
```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

14. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.2-14

This signalling flow shows the REGISTER request being forwarded from the P-CSCF to the I-CSCF in the home domain.

Table 6.3-14: REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

15. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. Because the user has registered, the HSS returns the I-CSCF with the S-CSCF address for the subscriber.

For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 14) which need to be sent to HSS, see table 6.2-16a.

Table 6.3-15a provides the parameters in the REGISTER request (flow 16), which are obtained from the information sent back from the HSS

Table 6.3-15a: User registration status query response (HSS to I-CSCF)

Message source & destination	Cx Information element name	Mapping to SIP header in REGISTER	Description
HSS to I-CSCF	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

16. REGISTER request (I-CSCF to S-CSCF) - see example in table 6.3-16

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 6.3-16: REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555:aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

17. Authentication

Upon receiving the REGISTER request, carrying the authentication response, RES, the S-CSCF checks that the user's active, XRES matches the received RES. If the check is successful then the user has been authenticated and the public user identity is registered in the S-CSCF.

18. Cx: S-CSCF registration notification procedure

On registering a user the S-CSCF informs the HSS that the user has been re-registered at this instance.

For detailed message flows see 3GPP TS 29.228.

19. 200 OK response (S-CSCF to I-CSCF) - see example in table 6.3-19

The S-CSCF sends acknowledgement to the I-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 6.3-19 200 OK response (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact: sip:[5555::aaa:bbb:ccc:ddd]
CSeq:
Date: Wed, 11 July 2001 08:49:37 GMT
Expires: 7200
Content-Length:
```

Path: The S-CSCF inserts its own name to the front of the list.

20. 200 OK response (I-CSCF to P-CSCF) - see example in table 6.3-20

The I-CSCF forwards acknowledgement from the S-CSCF to the P-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 6.3-20: 200 OK response (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

21. 200 OK response (P-CSCF to UE) - see example in table 6.3-21

The P-CSCF removes its address from the Path header, reverses the order of the fields, saves the resulting Path header and associates it with the UE. The P-CSCF then removes the Path header from the 200 OK response. The P-CSCF then forwards acknowledgement from the I-CSCF to the UE indicating that Registration was successful.

Table 6.3-21: 200 OK response (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

6.4 Registration signalling: mobile initiated deregistration (not provided)

An example of this flow is not shown in the present document.

6.5 UE subscription for the registration state event package

This subclause describes the subscription procedure for the registration state event , whereby the UE requests to be notified by the S-CSCF when the event has occurred. This is done using the information structure specified for the 'presence' package.

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network operator does not desire to keep its internal configuration hidden from the visited network. For this example the trigger point at the P-CSCF for sending out the SUBSCRIBE request is the 200 OK response of the users registration.

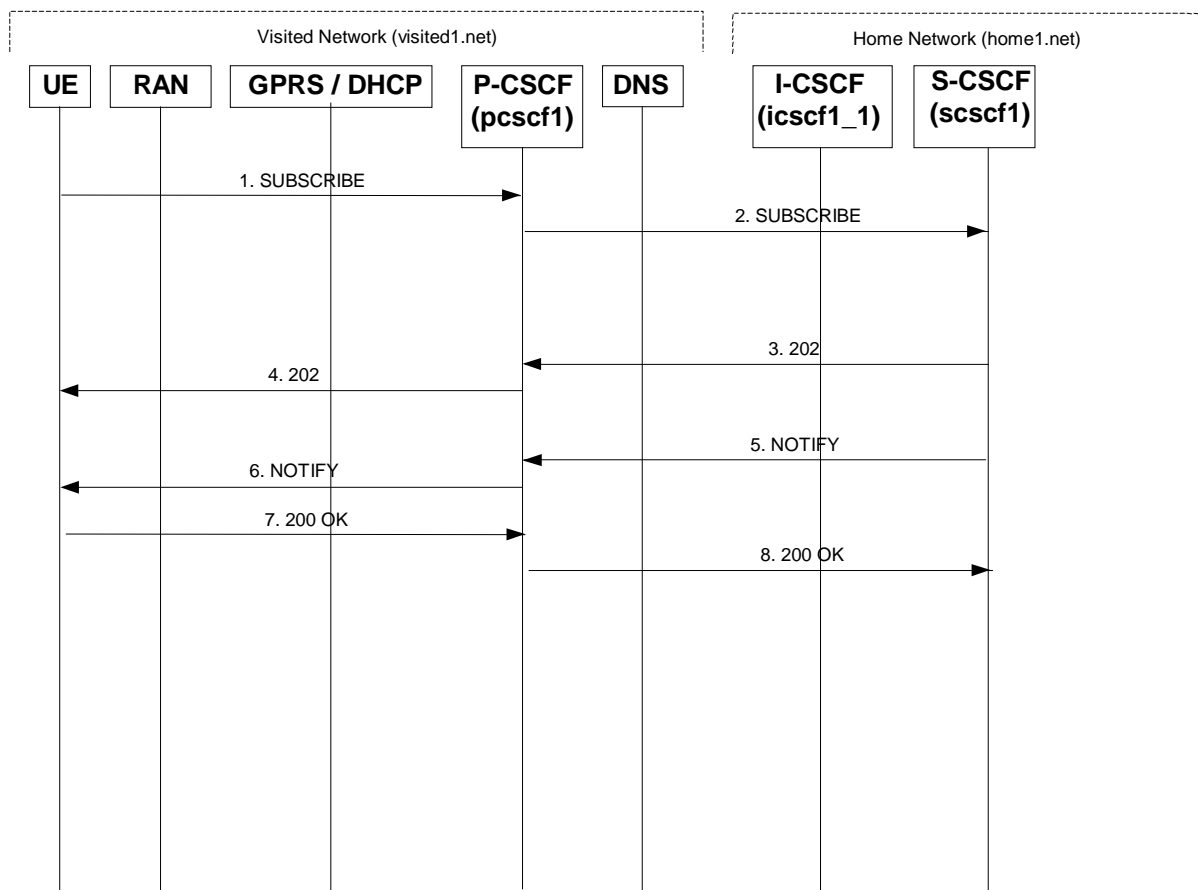


Figure 6.5-1: UE subscription for the registration state event package (without I-CSCF providing configuration independence)

1. SUBSCRIBE request (UE to P-CSCF) - see example in table 6.5-1

The UE sends SUBSCRIBE request for the registration-state event package.

Table 6.5-1: SUBSCRIBE request (UE to P-CSCF)

```

SUBSCRIBE sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 SUBSCRIBE
Event: presence
Expires: 7200
Accept: application/cpm-pidf+xml
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Content-Length: 0
    
```

- From:** This field is populated with logical representation (FQDN) for the entity sending the SUBSCRIBE.
- Event:** This field is populated with the value 'presence' to specify the use of the presence package.
- Accept:** This field is populated with the value 'application/cpim-pidf+xml' in keeping with the use of the 'presence' package.

2. SUBSCRIBE request (P-CSCF to S-CSCF) - see example in table 6.5-2

P-CSCF looks up the serving network information for the public user identity that was stored during the registration procedure. The SUBSCRIBE request is forwarded to S-CSCF.

Table 6.5-2: SUBSCRIBE request (P-CSCF to S-CSCF)

```
SUBSCRIBE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:user1_public1@home1.net
Record-Route: sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
```

Route: The Route: header is populated with the Request-URI received from the UE in the SUBSCRIBE.

3. 202 Accepted response (S-CSCF to P-CSCF) - see example in table 6.5-3

The S-CSCF sends an acknowledgement towards the UE indicating that the subscription was successful. This response will traverse the path that the SUBSCRIBE request took as described in the Via list.

NOTE 1: If the S-CSCF can process the SUBSCRIBE request and send the NOTIFY request immediately, it can send a 200 OK response instead of a 202 Accepted response.

Table 6.5-3: 202 Accepted response (S-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: scscf1.home1.net, pcscf1.home1.net
Remote-Party-ID: "Registrar" <sip:registrar.home1.net>
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Event:
Expires:
Content-Length:
```

Expires: If the value of the Expires header in SUBSCRIBE request is different from the one received in REGISTER method, then the value of Expires header in 202 Accepted is set to match the value of Expires header in REGISTER method.

4. 202 Accepted response (P-CSCF to UE) - see example in table 6.5-4

P-CSCF sends the response to UE.

Table 6.5-4: 202 Accepted response (P-CSCF to UE)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Content-Length:
```

5. NOTIFY request (S-CSCF to P-CSCF) - see example in table 6.5-5

The S-CSCF sends a first NOTIFY request towards the UE in order to inform the UE about the registration status of the monitored user.

In the example below, the NOTIFY specifies the following public user identity as registered (i.e. status=open): sip:user1_public1@home1.net, tel: +498972233114.

The following public user identity has been de-registered (i.e. status=closed) sip:user1_public2@home1.net. They are arranged in the preferred order of priority in this example.

The Route header is constructed from the information saved at registration.

Table 6.5-5: NOTIFY request (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq: 42 NOTIFY
Expires:
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>open</value></status>
  </tuple>

  <tuple name="sip:user1_public2@home1.net">
    <status> <value>closed</value> </status>
  </tuple>

  <tuple name="tel:+498972233114">
    <status><value>open</value></status>
  </tuple>

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE.

Content-Type: Set to the value of the Accept: header received in the subscribe or 'application/cpim-pidf+xml' if Accept: was not present in the SUBSCRIBE.

The message body in the NOTIFY request that carries the subscriber's registration state is of the following form:

- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.

- The <presence> element consist of one or more <tuple> elements and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload.
- Each <tuple> element carries the registration state of a single public user identity and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries a mandatory <value> = open|closed and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.

NOTE 2: The registration states in 3GPP are mapped as follows to the status values in the presence-package:

- Open (status value) is mapped to Registered (3GPP).
- Closed (status value) is mapped to De-Registered (3GPP).

Editor's Note: further mappings of status values to 3GPP are for future study

- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'.

6. NOTIFY request (P-CSCF to UE) - see example in table 6.5-6

The P-CSCF forwards the NOTIFY request to the UE.

Table 6.5-6: NOTIFY request (P-CSCF to UE)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Remote-Party-ID:
From:
To:
Call-ID:
CSeq:
Expires:
Event:
Content-Type:
Content-Length:
```

7. 200 OK response (UE to P-CSCF) – see example in table 6.5-7

The UE generates a 200 OK response to the NOTIFY.

Table 6.5-7 200 OK response (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:Content-Length: 0
```

8. 200 OK response (P-CSCF to S-CSCF) - see example in table 6.5-8

P-CSCF forwards the 200 OK to S-CSCF.

Table 6.5-8: 200 OK response (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

6.6 P-CSCF subscription for the registration state event package (without I-CSCF providing configuration independence)

This section describes the subscription procedure for the network initiated deregistration event, whereby the P-CSCF requests to be notified by the S-CSCF when the event has occurred. This is done using the 'presence' package.

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network operator does not desire to keep its internal configuration hidden from the visited network. For this example the trigger point at the P-CSCF for sending out the SUBSCRIBE request is the 200 OK response of the users registration.

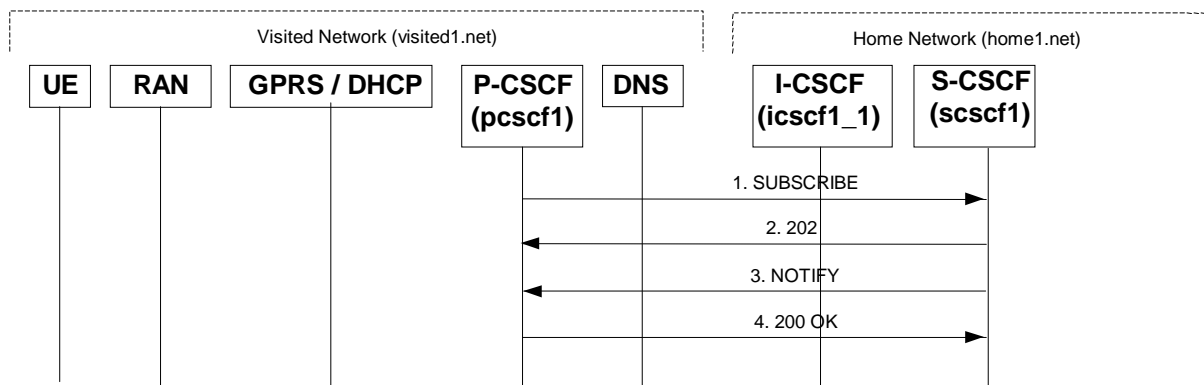


Figure 6.6-1: P-CSCF subscription for the registration state event package (without I-CSCF providing configuration independence)

1. SUBSCRIBE request (P-CSCF to S-CSCF) - see example in table 6.6-1

The P-CSCF sends SUBSCRIBE request for the registration-state event package.

Table 6.6-1: SUBSCRIBE request (P-CSCF to S-CSCF)

```
SUBSCRIBE scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From: <sip:pcscf1.visited1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: 223456789@pcscf1.visited1.net
CSeq: 61 SUBSCRIBE
Event: presence
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:pcscf1.visited1.net>
Content-Length: 0
```

From: This header is populated with the SIP URI that identifies the P-CSCF.

Contact: This is where the NOTIFY requests for this subscription will be sent. It consists of the SIP URL-escaped public user identity at the P-CSCF.

Event: This field shall be set to the value 'presence' to specify the use of the presence package.

Accept: This field shall be set to the value 'application/cpim-pidf+xml' in keeping with the use of the 'presence' package.

2. 202 Accepted response (S-CSCF to P-CSCF) - see example in table 6.6-2

The S-CSCF sends an acknowledgement towards the P-CSCF indicating that the subscription was successful. This response will traverse the path that the SUBSCRIBE request took as described in the Via list.

NOTE 1: If the S-CSCF can process the SUBSCRIBE request and send the NOTIFY request immediately, it can send a 200 OK response instead of a 202 Accepted response.

Table 6.6-2: 202 Accepted response (S-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID: "Registrar" <sip:registrar.home1.net>
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Event:
Expires:
Content-Length:
```

Expires: If value of the Expires header in SUBSCRIBE request is different from the one received in REGISTER method, then the value of Expires header in 202 Accepted is set to match the value of Expires header in REGISTER method.

3. NOTIFY request (S-CSCF to P-CSCF) - see example in table 6.6-3

The S-CSCF sends a first NOTIFY request towards the P-CSCF in order to inform the P-CSCF about the registration status of monitored user.

Table 6.6-3: NOTIFY request (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Remote-Party-ID: "Registrar" <sip:user1_public1@registrar.home1.net>
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@pcscf1.visited1.net>;tag=31415
Call-ID: 223456789@pcscf1.visited1.net
CSeq: 42 NOTIFY
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

    <tuple name="sip:user1_public1@home1.net">
        <status><value>closed</value></status>
    </tuple>

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE.

Content-Type: Set to the value of the Accept: header received in the subscribe or 'application/cpim-pidf+xml' if Accept: was not present in the SUBSCRIBE.

The message body in the NOTIFY request that carries the subscriber's registration state is of the following form:

- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.
- The <presence> element consist of one or more <tuple> elements and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload.
- Each <tuple> element carries the registration state of a single public user identity and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries a mandatory <value> = open|closed and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.

NOTE 2: The registration states in 3GPP are mapped as follows to the status values in the presence-package:

- Open (status value) is mapped to Registered (3GPP).
- Closed (status value) is mapped to De-Registered (3GPP).

Editor's Note: further mappings of status values to 3GPP are for future study

- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'.

4. 200 OK response (P-CSCF to S-CSCF) - see example in table 6.6-4

P-CSCF forwards the 200 OK to S-CSCF.

Table 6.6-4: 200 OK response (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Type:
Content-Length: 0
```

6.7 Notifying of the network initiated deregistration event

6.7.1 Network Initiated Deregistration event occurs in the S-CSCF

Figure 6.7.1-1 assumes that the UE and the P-CSCF both have subscribed for the Users registration state event package according to subclause 6.5 and shows how the UE and the P-CSCF are notified when the Network Initiated Deregistration event occurs in the S-CSCF.

Also, it is assumed that the home network does not have network configuration hiding active.

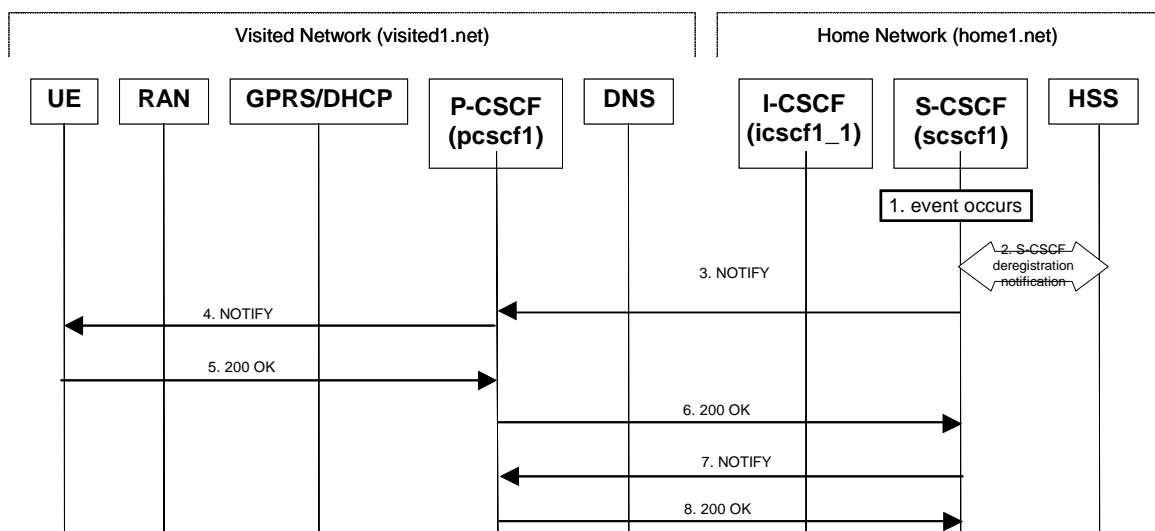


Figure 6.7.1-1: Network Initiated Deregistration event occurs in the S-CSCF

1. Network Initiated Deregistration event occurs in the S-CSCF
2. S-CSCF deregistration notification

When the Network Initiated Deregistration Event occurs in the S-CSCF, the S-CSCF sends an update to the HSS to remove itself as the registered S-CSCF for this UE. And HSS sends response to confirm.

For detailed message flows see 3GPP TS 29.228.

3 SIP NOTIFY (S-CSCF to P-CSCF) - see example in table 6.7.1-3

After the S-CSCF deregistration notification procedure the S-CSCF immediately sends a NOTIFY towards the UE in order to inform about the network initiated deregistration. The same Request URI, To, From, Call-ID are used as in the first NOTIFY. CSeq is incremented since this is the second NOTIFY request sent towards the UE.

Table 6.7.1-3: SIP NOTIFY (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID: b89rjhmedlrfjflslj40a222
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">
  <tuple name="sip:user1_public1@home1.net">
    <status><value>closed</value>
    <detail>
      reason-phrase: "You have been deregistered from the network, please register
again";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

  <tuple name="sip:user1_public2@home1.net">
    <status> <value>closed</value> </status>
  </tuple>

  <tuple name="tel:+498972233114">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This ID has been automatically de-registered";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

</presence>
```

4. SIP NOTIFY (P-CSCF to UE) - see example in table 6.7.1-4

P-CSCF forwards the NOTIFY request to the UE.

Table 6.7.1-4: SIP NOTIFY (P-CSCF to UE)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Expires:
Event:
Content-Length:
```

5. 200 OK (UE to P-CSCF) - see example in table 6.7.1-5

Table 6.7.1-5: SIP 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

6. SIP 200 OK (P-CSCF to S-CSCF) - see example in table 6.7.1-6

Table 6.7.1-6: SIP 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7 SIP NOTIFY (S-CSCF to P-CSCF) - see example in table 6.7.1-7

After sending the Cx.Put request the S-CSCF also immediately sends a NOTIFY towards the P-CSCF to which the UE is attached to, in order to inform about the network initiated deregistration. The same Request URI, To, From, Call-ID are used as in the first NOTIFY. CSeq is incremented since this is the second NOTIFY request sent towards the P-CSCF.

Table 6.7.1-7: SIP NOTIFY (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visited1.net>;tag=31415
Call-ID: 1234567890@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This public ID has been de-registered by the network";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

<tuple name="sip:user1_public2@home1.net">
  <status><value>closed</value> </status>
</tuple>

<tuple name="tel:+498972233114">
  <status><value>closed</value>
  <detail>
    reason-phrase: "This ID has been automatically de-registered";
    registrar: registrar.home1.net
  </detail>
</status>
</tuple>

</presence>
```

8. SIP 200 OK (P-CSCF to S-CSCF) - see example in table 6.7.1-8

Table 6.7.1-8: SIP 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

6.7.2 Network Initiated Deregistration event occurs in the HSS

Figure 6.7.2-1 assumes that the UE and the P-CSCF both have subscribed for the Users registration state event package according to subclause 6.5 and shows how the UE and the P-CSCF are notified when the Network Initiated Deregistration event occurs in the HSS.

Also, it is assumed that the home network does not have network configuration hiding active.

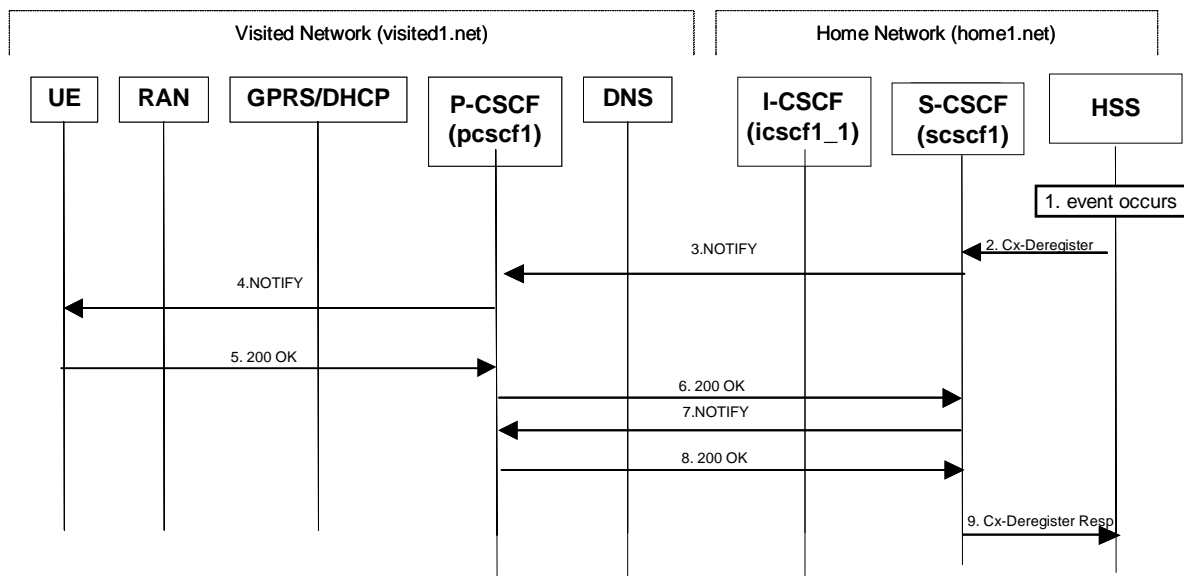


Figure 6.7.2-1: Network Initiated Deregistration event occurs in the HSS

1. Network Initiated Deregistration event occurs in the HSS

2. Cx-Deregister

HSS initiates the de-registration, sending a Cx-Deregister (subscriber identity). For detailed message information see 3GPP TS 29.228.

3. SIP NOTIFY (S-CSCF to P-CSCF) - see example in table 6.7.2-3

After getting the Cx-Deregister message the S-CSCF immediately sends a NOTIFY towards the UE order to inform about the network initiated deregistration. The same Request URI, To, From, Call-ID are used as in the first NOTIFY. CSeq is incremented since this is the second NOTIFY request sent towards the UE.

Table 6.7.2-3: SIP NOTIFY (S-CSCF to P-CSCF)

```

NOTIFY sip:pcscf1.homel.net SIP/2.0
Via: SIP/2.0/UDP scscf1.homel.net;branch=332b23.1
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@homel.net>;tag=151170
To: <sip:user1_public1@homel.net>;tag=31415
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@homel.net">
    <status><value>closed</value>
    <detail>
      reason-phrase: "You have been deregistered from the network, please register
again";
      registrar: registrar.homel.net
    </detail>
  </status>
</tuple>

  <tuple name="sip:user1_public2@homel.net">
    <status> <value>closed</value> </status>
  </tuple>

  <tuple name="tel:+498972233114">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This ID has been automatically de-registered";
      registrar: registrar.homel.net
    </detail>
  </status>
</tuple>

</presence>

```

4. SIP NOTIFY (P-CSCF to UE) - see example in table 6.7.2-4

P-CSCF forwards the NOTIFY response to the UE.

Table 6.7.2-4: SIP NOTIFY (P-CSCF to UE)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Expires:
Event:
Content-Length:

```

5. 200 OK (UE to P-CSCF) - see example in table 6.7.2-5**Table 6.7.2-5: SIP 200 OK (UE to P-CSCF)**

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

6. SIP 200 OK (P-CSCF to S-CSCF) - see example in table 6.7.2-6

Table 6.7.2-6: SIP 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7 SIP NOTIFY (S-CSCF to P-CSCF) - see example in table 6.7.2-7

After receiving the 200 OK from the UE the S-CSCF also immediately sends a NOTIFY towards the P-CSCF to which the UE is attached to, in order to inform about the network initiated deregistration. The same Request URI, To, From, Call-ID are used as in the first NOTIFY. CSeq is incremented since this is the second NOTIFY request sent towards the P-CSCF.

Table 6.7.2-7: SIP NOTIFY (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visisted1.net>;tag=31415
Call-ID: 1234567890@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This public ID has been de-registered by the network";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

  <tuple name="sip:user1_public2@home1.net">
    <status> <value>closed</value> </status>
  </tuple>

  <tuple name="tel:+498972233114">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This ID has been automatically de-registered";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

</presence>
```

8. SIP 200 OK (P-CSCF to S-CSCF) - see example in table 6.7.2-8

Table 6.7.2-8 SIP 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

9. Cx-Deregister Resp

After receiving the 200 OK from the P-CSCF, the S-CSCF sends Cx-Deregister Resp to the HSS. For detailed message information see 3GPP TS 29.228.

6.7.3 Network Initiated De-Registration Upon UE Roaming and Registration to a New Network. Assumes that the previous registration has not expired

This shows the registration signalling flow for the scenario that the UE loses the GPRS attachment in current visited access network and roams to makes a new GPRS attachment in a new visited access network without de-registration from its previous network the IMS. The GGSN and P-CSCF are assumed to be in the visited network. When the UE starts registration in via the new visited access network and P-CSCF, the home S-CSCF in the home IMS network initiates the de-registration to its the P-CSCF in the previous visited IMS network. It is assumed that the old P-CSCF has subscribed the event package to the S-CSCF and the subscription has not expired. For the reason of simplicity, the authentication procedure is not shown because it has no technical impact on this flow.

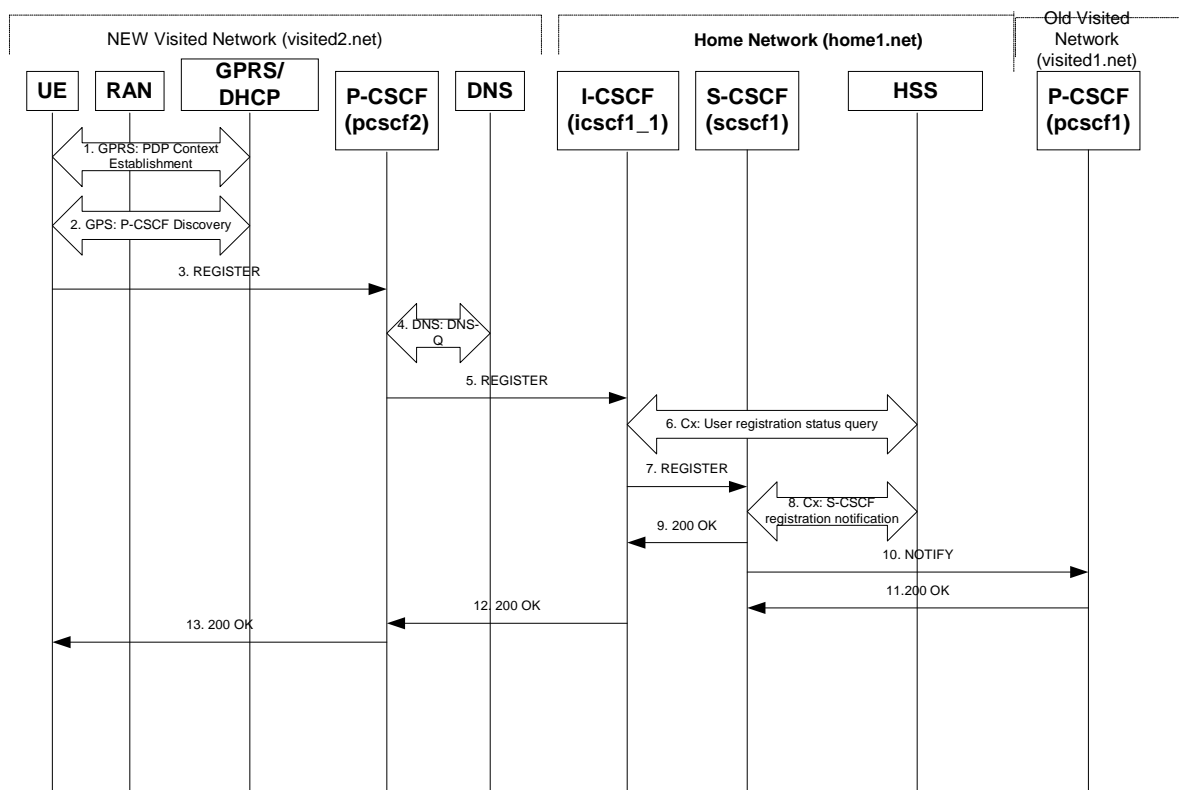


Figure 6.7.3-1: Network Initiated De-registration upon UE roaming without De-registration

Flows from 1 to 5 are the same as those in subclause 6.2.

6. Cx: User Registration Status Query

The I-CSCF shall send the Cx-Query signalling flow to the HSS (Visited Network Identifier, subscriber identity, home domain name,). Because user has not de-registered with its previous network, so that HSS finds a S-CSCF assigned for that user and treats this as a re-registration procedure. Therefore, the HSS returns the S-CSCF name to the I-CSCF. For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 5) which need to be sent to HSS, see table 6.2-5a.

Table 6.3-15a provides the parameters in the REGISTER (flow 7) message which are obtained from the information sent back from the HSS.

7. REGISTER (I-CSCF to S-CSCF)

The I-CSCF forwards the REGISTER to S-CSCF assigned to that user.

8. Cx-S-CSCF Registration Notification

The S-CSCF shall notify the HSS to update its location information for that subscriber. The HSS sends a response to the S-CSCF to acknowledge the update of location information and also with the user profile.

10. NOTIFY (S-CSCF to Old P-CSCF) - see example in table 6.7.3-10

Upon receiving flow 7, the S-CSCF found that the P-CSCF address in that message is different with the one in its database, so that the S-CSCF knows that the UE has left its previous P-CSCF without de-register itself. And the old P-CSCF has subscribed with the registration event package for that user, therefore, the S-CSCF sends a NOTIFY to that P-CSCF.

Table 6.7.3-10: SIP NOTIFY (S-CSCF to Old P-CSCF)

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visisted1.net>;tag=31415
Call-ID: 1234567890@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>closed</value>
    <detail>
      reason-phrase: "This public ID has been de-registered by the network";
      registrar: registrar.home1.net
    </detail>
  </status>
</tuple>

<tuple name="sip:user1_public2@home1.net">
  <status><value>closed</value> </status>
</tuple>

<tuple name="tel:+498972233114">
  <status><value>closed</value>
  <detail>
    reason-phrase: "This ID has been automatically de-registered";
    registrar: registrar.home1.net
  </detail>
</status>
</tuple>

</presence>
```

11. SIP 200 OK (Old P-CSCF to S-CSCF) - see example in table 6.7.3-11

Upon receiving the NOTIFY, the P-CSCF discards any information binding with that user.

Table 6.7.3-11: SIP 200 OK (Old P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

6.8 Network initiated re-authentication

This subclause describes the notification of a user about the re-authentication event that occurs at the S-CSCF assigned to that user.

It is assumed that user has registered and also subscribed to the registration state event before. Also, the subscriber is considered to be roaming and the home network operator does not desire to keep its internal configuration hidden from the visited network.

After this procedure the users UE might automatically initiated re-registration procedures.

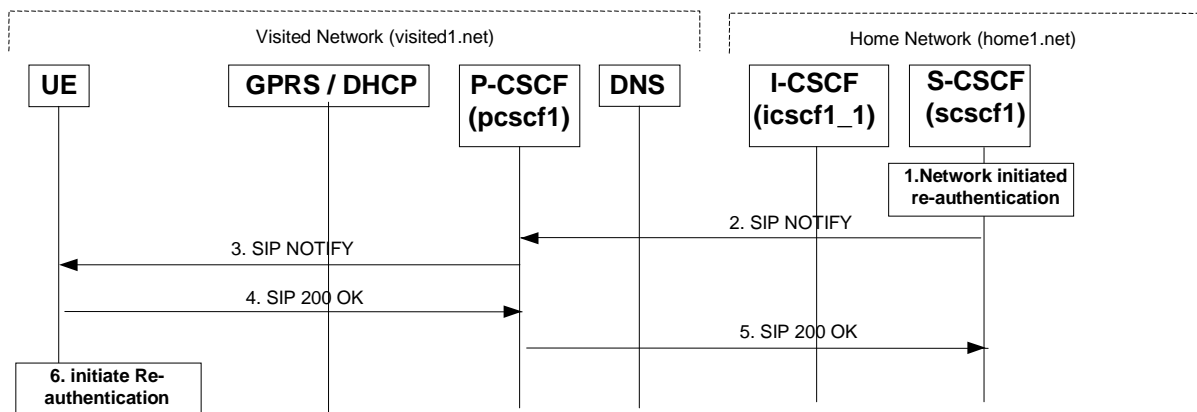


Figure 6.8-1: S-CSCF informs UE about network initiated re-authentication event (without I-CSCF providing configuration independence)

1. Network initiated re-authentication (S-CSCF)

The network initiated re-authentication event for the private user identity of the user occurs at the S-CSCF. As the user has subscribed to the registration state event package this is the trigger point for the S-CSCF to notify the user about the event occurrence.

2. SIP NOTIFY request (S-CSCF to P-CSCF) - see example in table 6.8-2

The S-CSCF sends a NOTIFY request towards the UE in order to inform the UE about the occurrence of the network initiated re-authentication event.

The Route header is constructed from the information saved at registration.

Table 6.8-2: SIP NOTIFY request (S-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq: 43 NOTIFY
Expires:
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>re-authenticate</value></status>
  </tuple>
</presence>
```

- From:** The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE.
- Content-Type:** Set to the value of the Accept: header received in the subscribe or 'application/cpim-pdf+xml' if Accept: was not present in the SUBSCRIBE.

The message body in NOTIFY that carries the subscriber's registration state is of the following form:

- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.
- The <presence> element consist of only one <tuple> element and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload..
- The <tuple> element carries the registration state the public user identity and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries the <value> = re-authenticate and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.
- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'

3. SIP NOTIFY request (P-CSCF to UE) - see example in table 6.8-3

P-CSCF forwards the NOTIFY message to UE.

Table 6.8-3: SIP NOTIFY request (P-CSCF to UE)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Remote-Party-ID:
From:
To:
Call-ID:
CSeq:
Expires:
Event:
Content-Type:
Content-Length:
```

4. SIP 200 OK response (UE to P-CSCF) - see example in table 6.8-4

The UE generates a 200 OK response to the NOTIFY.

Table 6.8-4: SIP 200 OK response (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:Content-Length: 0
```

5. SIP 200 OK response (P-CSCF to S-CSCF) - see example in table 6.8-5

P-CSCF forwards the 200 OK to S-CSCF.

Table 6.8-5: SIP 200 OK response (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

6. Re-authentication (UE)

The UE shall now initiate re-authentication procedures.

6.9 Registration error conditions

6.9.1 Reregistration - failure of reregistration

See subclause 16.9.1.

6.9.2 User not registered, user not allowed to roam / user unknown

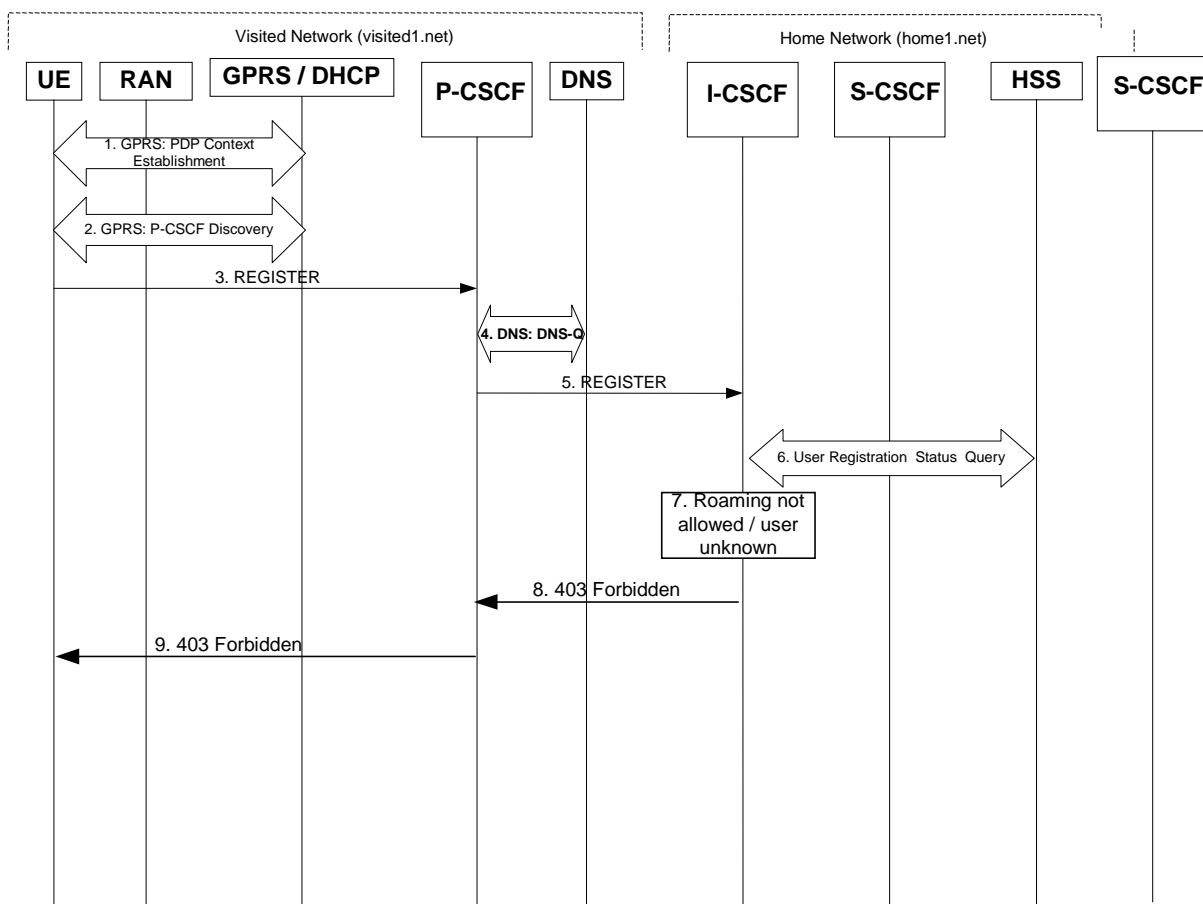


Figure 6.9.2-1: Registration failure: User not registered, user not allowed to roam

The first six steps are similar with the regular Registration signalling flows described in subclause 16.2.

The "Roaming not allowed" and "User unknown" error conditions would result in the same signalling flow (only the actions taken by I-CSCF will differ), thus the signalling flows are merged and only the I-CSCF action is described depending on the error condition.

7. Roaming not allowed / User unknown

The information received as a response to the Cx-Query may indicate that "Roaming is not allowed" for the subscriber from the visited1.net network. In this case I-CSCF needs to send a 403 Forbidden response back to the UE. I-CSCF will insert a warning header in the response, indicating to the UE the reason of refusing the Registration request. Warning header should contain the name of the network inserting the warning header (warn-agent = icscf1.home1.net) and optionally a warn-text. In case the network operator would like to advise the subscriber to attach instead to the CS domain then the warn-code 312 should be inserted in the warning header.

When the information received as a response to the Cx-Query indicates that the subscriber is unknown to the network or the subscriber does not have a valid subscription, the I-CSCF needs to send a 403 Forbidden response back to the UE. I-CSCF will insert a warning header in the response, indicating to the UE the reason of refusing the Registration request. Warning header should contain the name of the network inserting the warning header (warn-agent = icscf1.home1.net) and optionally a warn-text.

8. 403 Forbidden (I-CSCF to P-CSCF) - see example in table 6.9.2-8

Table 6.9.2-8: 403 Forbidden (I-CSCF to P-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Warning: 312 home1.net "Roaming not allowed from this network"
From:
To:
Call-ID:
Cseq:
Content-Length:
```

9. 403 Forbidden (P-CSCF to UE) - see example in table 6.9.2-9

Table 6.9.2-9: 403 Forbidden (P-CSCF to UE)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Warning: 312 home1.net "Roaming not allowed from this network"
From:
To:
Call-ID:
Cseq:
Content-Length:
```

6.9.3 Registration failure – user authentication failure

This clause (see figure 6.9.3-1) shows the signalling flow with user authentication failure at step 19 of subclause 6.2 "Signalling flows for REGISTER" and a final failure of the authentication at step 30.

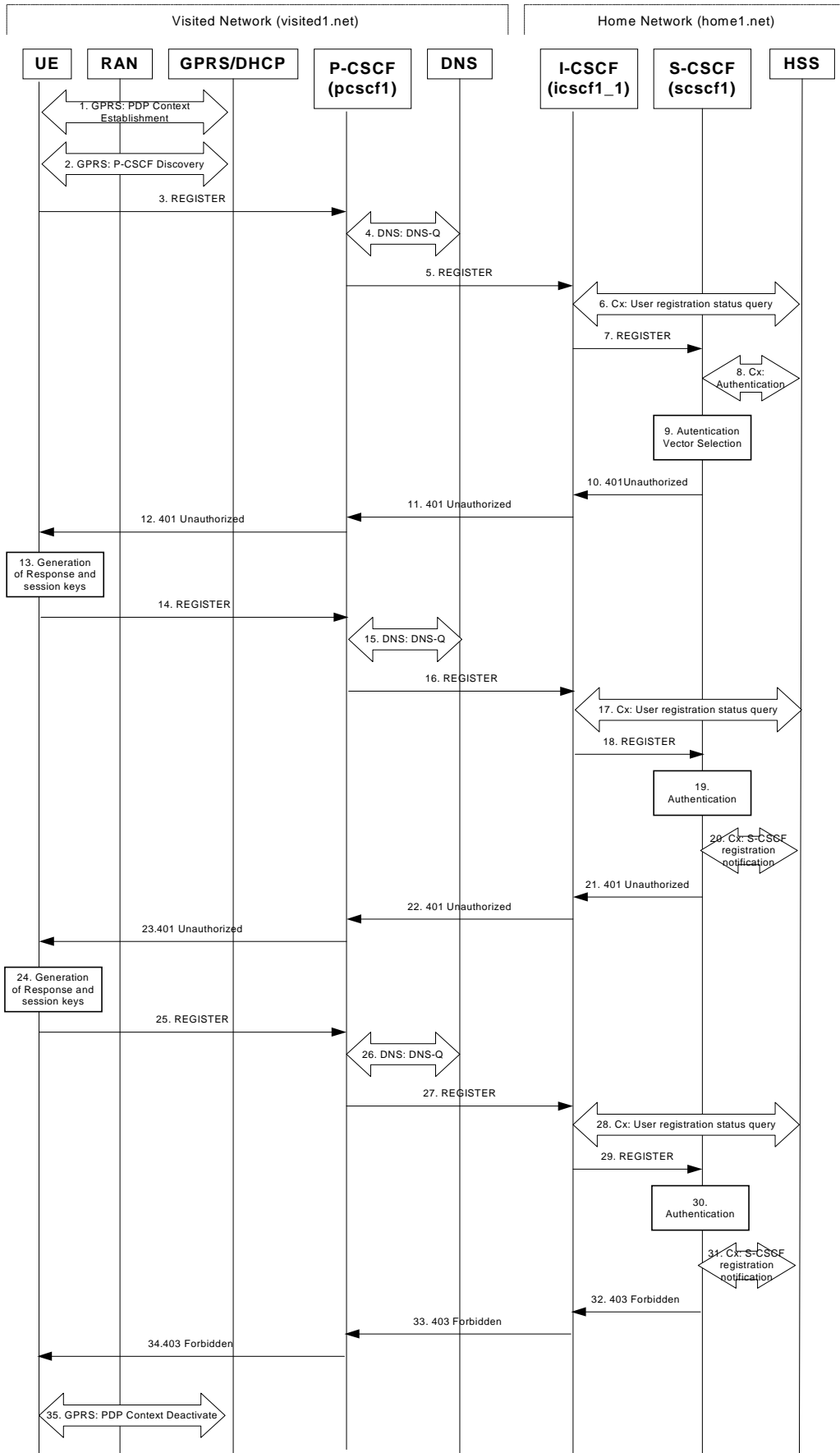


Figure 6.9.3-1: User Authentication Failure

Steps 1 through 18 are the same as the signalling flow in subclause 6.2.

19. Authentication: User authentication fails

Upon receiving the REGISTER request carrying the authentication response, RES, the S-CSCF checks that the user's active, XRES matches the received RES. If the check is unsuccessful then this authentication challenge fails and the public user identity is not yet registered in the S-CSCF.

At this point the S-CSCF has the option of repeating a number of authentication challenges as given in step 19 through 29. For the purposes of this flow, only one repetition is shown.

20. Cx. SCGF registration notification

The S-CSCF selects new authentication vectors as specified in step 9, either from the list already within the S-CSCF, or by requesting new vectors from the HSS.

21. 401 Unauthorized response (S-CSCF to I-CSCF) - see example in table 6.9.3-21

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.9.3-21: 401 Unauthorized response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID: apb03a0s09dkjdfglkj49111
WWW-Authenticate: eap eap-p=base64(user1_privatel@home1.net, RAND, AUTN)
CSeq: 2 REGISTER
Content-Length: 0
```

NOTE: The actual WWW-Authenticate header value may look like this as it is in base64 form:
WWW-Authenticate: eap eap-p=QWxh4ZGRpb2jpvGvUNlctZQ==

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

22. 401 Unauthorized response(I-CSCF to P-CSCF) - see example in table 6.9.3-22

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 6.9.3-22: 401 Unauthorized response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

23. 401 Unauthorized response (P-CSCF to UE) - see example in table 6.9.3-23

The P-CSCF removes any keys received in the 401 Unauthorized response and forwards the rest of the response to the UE.

Table 6.9.3-23: 401 Unauthorized response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_privatel.home1.net, RAND, AUTN)
CSeq:
Content-Length:
```

24. Generation of response and session keys at UE

Upon receiving the Unauthorised response, the UE extracts the MAC and the SQN from the AUTN. The UE calculates the XMAC and checks that XMAC matches the received MAC and that the SQN is in the correct range. If both these checks are successful the UE calculates the response, RES, and also computes the session keys IK and CK. The RES is put into the Authorization header and sent back to the registrar in the REGISTER request.

25. REGISTER request (UE to P-CSCF) - see example in table 6.9.3-25**Table 6.9.3-25: REGISTER request (UE to P-CSCF)**

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49112
Authorization: eap eap-p=base64(user1_privatel@home1.net, RES)
CSeq: 3 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 12 along with the private user identity both encoded in base64 format.

26. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 6.9.3-26a: DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC 2782 [4].

Table 6.9.3-26b: DNS Query Response (DNS to P-CSCF)

```
OPCODE=SQUERY, RESPONSE, AA
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip._udp.registrar.home1.net      0 IN SRV 1 10 5060 icscf1_p.home1.net
                                   0 IN SRV 1 0 5060 icscf7_p.home1.net

icscf1_p.home1.net                 0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                 0 IN AAAA      5555::ala:b2b:c3c:d4d
```


In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

27. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.9.3-27

This signalling flow shows the REGISTER request being forwarded from the P-CSCF to the I-CSCF in the home domain.

Table 6.9.3-27: REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

28. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. The HSS returns the S-CSCF required capabilities and the I-CSCF uses this information to select a suitable S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.9.3-28a provides the parameters in the REGISTER request (flow 5) which need to be sent to HSS.

Table 6.9.3-28a Cx: User registration status query procedure (I-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
I-CSCF to HSS	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol.
	Public User Identity	To:	Identity which is used to communicate with other users
	Visited Network Identifier	Roaming-Info: vnid	This information indicates the network identifier of the visited network

29. REGISTER request (I-CSCF to S-CSCF) - see example in table 6.9.3-29

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 6.9.3-29: REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

30. Authentication

Upon receiving the REGISTER request carrying the authentication response, RES, the S-CSCF checks that the user's active, XRES matches the received RES. If the check is unsuccessful, and no more authentication challenges are to be made, then the authentication has failed and the public user identity is not registered in the S-CSCF.

31. Cx: S-CSCF registration notification procedure

Upon user authentication failure the S-CSCF informs the HSS that the user has not been registered at this instance. The HSS clears the S-CSCF name for that subscriber.

For detailed message flows see 3GPP TS 29.229.

Table 6.9.3-31 provides the parameters in the REGISTER request (flow 18) which need to be sent to HSS.

Table 6.9.3-31 Cx: S-CSCF registration notification procedure (S-CSCF to HSS)

Message source & destination	Cx Information element name	Information Source in REGISTER	Description
S-CSCF to HSS	Public User Identify	To:	Identity which is used to communicate with other users
	Private User Identity	Authorization:	The Private User Identity is encoded according to the Authorization protocol. Unique identity in IMS which is used by network to authenticate this user
	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

32. 403 Forbidden response (S-CSCF to I-CSCF) - see example in table 6.9.3-32

The S-CSCF sends an 403 Forbidden response to the I-CSCF indicating that authentication failed. No security parameters are included in this message.

Table 6.9.3-32: 403 Forbidden (S-CSCF to I-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID: apb03a0s09dkjdfgk49111
CSeq: 3 REGISTER
Content-Length: 0
```

33. 403 Forbidden response (I-CSCF to P-CSCF) - see example in table 6.9.3-33

The I-CSCF forwards the 403 Forbidden response from the S-CSCF to the P-CSCF indicating that authentication was unsuccessful.

Table 6.9.3-33: 403 Forbidden response (I-CSCF to P-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

34. 403 Forbidden response (P-CSCF to UE) - see example in table 6.9.3-33

The P-CSCF forwards the 403 Forbidden response to the UE.

Table 6.9.3-34: 403 Forbidden response (P-CSCF to UE)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. PDP Context Deactivate

On receiving the 403 Forbidden response the UE ceases registration and authentication attempts. In this case, if the PDP context on which the SIP signalling was being conducted is not being used for other purposes, the UE deactivates the signalling PDP context.

7 Signalling flows for session initiation (non hiding)

Editors Note: The purpose of this "duplicate" Editors Note is to capture the fact that the following changes have only been partially implemented, Note that a more comprehensive explanation is given in Annex B-2.

- The initial INVITE and any network initiated requests is routed from Terminating S-CSCF to Terminating P-CSCF using a Route header constructed from the information saved from the Path header during registration of called subscriber.
- The content of Record Route headers from the initial INVITE and its 183 SDP messages are stored in P-CSCFs before P-CSCFs removes it from the request (response) which is delivered to the UE. This is then used for routing subsequent requests.
- The route (the entries found in the Record Route header) between Originating P-CSCF and Terminating S-CSCF will be stored by Terminating S-CSCF from the initial INVITE request and used for routing subsequent requests originated by Terminating S-CSCF.
- Originating S-CSCF will store the route (the entries found in the Record Route header) between itself and Terminating P-CSCF from the 183 SDP provisional response and used for routing subsequent requests originated by Originating S-CSCF
- PRACK and COMET will be routed with Route header constructed from Record Route headers saved in

P-CSCFs from initial INVITE and 183 SDP

- NO S-CSCFs neither I-CSCFs remove entries from any of the headers
- The Contact header is not modified during session setup.

7.1 Introduction

Editor's note: The following issues, contributed in N1-001094 issue 3, needs to be reflected in flows for INVITE, and for subsequent flows after INVITE.

The requirement of caller-id-blocking (aka calling-line-identification-blocking, CLIB), in an IP environment requires that the IP address of the caller be blocked as well. If it was not, a mere 'traceroute' would provide the called party essentially all the information of caller-id.

Editor's Note: Need to show ENUM interactions at the S-CSCF.

This subclause breaks down the signalling flows for establishing sessions into a number of individual procedures, following the same principles as 3GPP TS 23.228 [2] subclause 5.4.9.

For the purposes of this document, a further breakdown has been necessary, and therefore a number of signalling flows have been given an (a) or (b) suffix, so that the signalling flows for establishing sessions where configuration independence is applied may be distinguished from those where it is not, e.g.:

- (MO#1a) Mobile origination, roaming, without I-CSCF providing configuration independence.
- (MO#1b) Mobile origination, roaming, with I-CSCF in home network providing configuration independence.

7.2 Origination procedures

7.2.1 Introduction

This subclause presents the detailed signalling flows to define the procedures for session originations.

The session origination procedures specify the signalling path between the UE initiating a session attempt and the S-CSCF that is assigned to perform the session origination service. This signalling path is determined at the time of UE registration, and remains fixed for the life of the registration.

A UE always has a proxy (P-CSCF) associated with it. This P-CSCF is located in the same network as the UE, performs resource authorization, and may have additional functions in handling of emergency sessions. The P-CSCF is determined by the CSCF discovery process.

As a result of the registration procedure, the P-CSCF determines the next hop toward the S-CSCF. This next hop may be directly to the S-CSCF (MO#1a for the roaming case, MO#2 for the home case), or to an I-CSCF who forwards the request to the S-CSCF (MO#1b). These next-hop addresses could be IPv6 addresses, or could be names that are translated via DNS to an IPv6 address.

Sessions originated in the PSTN to a mobile destination are a special case of the Origination procedures and three possibilities to route such sessions are detailed. In the first one, all sessions originated in the PSTN are routed towards the IM CN subsystem. The MGCF uses H.248/MEGACO to control a Media Gateway, and communicates with the SS7 network. In case of interworking between IP based and SS7 based signalling network is required, a SGW would be used [2]. The MGCF initiates the SIP request, and subsequent nodes consider the signalling as if it came from a S-CSCF. In the second one, all sessions originated in the PSTN are routed towards the CS domain. The entry point of the network is then a G-MSC. In the third one, the operator can choose to handle simultaneously the first two routing possibilities and a way to handle this flexibility is detailed.

7.2.2 MO#1a

7.2.2.1 (MO#1a) Mobile origination, roaming (S-S#1a, MT#1a assumed)

Figure 7.2.2.1-1 shows an origination procedure which applies to roaming subscribers when the home network operator does not desire to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates a S-CSCF. The home network provides the S-CSCF name/address as the entry point from the visited network.

When registration is complete, P-CSCF knows the name/address of the S-CSCF.

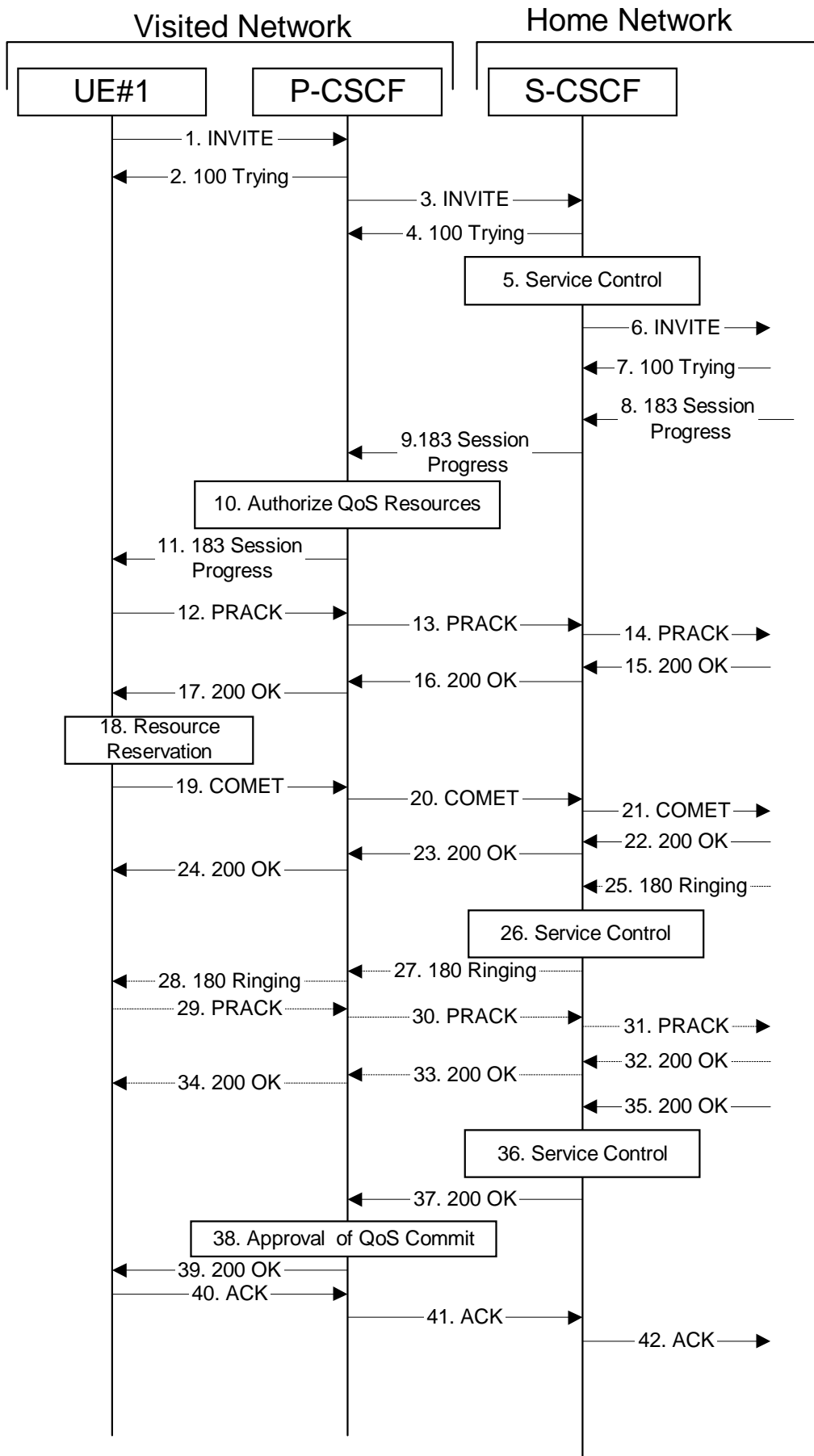


Figure 7.2.2.1-1: MO#1a

Procedure MO#1a is as follows:

1. INVITE (UE to P-CSCF) - see example in table 7.2.2.1-1

UE#1 determines the complete set of codecs that it is capable of supporting for this session. It builds a SDP containing bandwidth requirements and characteristics of each, and assigns local port numbers for each possible media flow. Multiple media flows may be offered, and for each media flow (m= line in SDP), there may be multiple codec choices offered.

For this example, assume UE#1 is capable of sending two simultaneous video streams, either H261 or MPV format, and two simultaneous audio streams, either AMR, G726-32, PCMU, or G728.

UE sends the INVITE request, containing an initial SDP, to the P-CSCF determined via the CSCF discovery mechanism. The initial SDP may represent one or more media for a multimedia session.

Editor's Note: Need to insure the codec negotiation procedures are compatible with the procedures brought into release 4 for CS domain services (BICC).

Table 7.2.2.1-1: INVITE (UE to P-CSCF)

```
INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 98 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=rtpmap:98 H261
a=rtpmap:99:MPV
a=qos:mandatory sendrecv
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
```

Request-URI: contains the keyed number from the user. This is specified by the UE as sip:<keyed number>@home1.net. This is in accordance to standard IETF procedures for specifying dialled digits.

Via: contains the IP address or FQDN of the originating UE.

Remote-Party-ID: contains the public user identity. The Display name is optional.

- From:/To:/Call-ID:** follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
- Cseq:** is a random starting number.
- Contact:** is the SIP URL that contains the IP address or FQDN of the originating UE.
- SDP** The SDP contains a set of codecs supported by UE#1 and desired by the user at UE#1 for this session.

Upon receiving the INVITE, the P-CSCF stores the following information about this session, for use in possible error recovery actions - see example in table 7.2.2.1-1b.

Table 7.2.2.1-1b: Storage of information at P-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact(local): sip:[5555::aaa:bbb:ccc:ddd]
```

2. 100 Trying (P-CSCF to UE) - see example in table 7.2.2.1-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.2.2.1-2: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. INVITE (P-CSCF to S-CSCF) - see example in table 7.2.2.1-3

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes the Request-URI in the request. This next hop is the S-CSCF within the home network of UE#1.

P-CSCF adds itself to the Record-Route header and Via header.

P-CSCF#1 examines the media parameters, and removes any choices that the network operator decides based on local policy, not to allow on the network.

For this example, assume the network operator disallows H261 video encoding.

The INVITE request is forwarded to the S-CSCF.

Table 7.2.2.1-3: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf1.visited1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Request-URI: is the first component in the remembered Path header from Registration.

Route: contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams no longer list code 98 (H261).

Upon receiving the INVITE, the S-CSCF stores the following information about this session, for use in possible error recovery actions - see example in table 7.2.2.1-3b.

Table 7.2.2.1-3b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.visited1.net

```

4. 100 Trying (S-CSCF to P-CSCF) - see example in table 7.2.2.1-4

S-CSCF responds to the INVITE request (3) with a 100 Trying provisional response.

Table 7.2.2.1-4: 100 Trying (S-CSCF to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

5. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

6. INVITE (MO#1 to S-S) - see example in table 7.2.2.1-6

S-CSCF forwards the INVITE request, as specified by the S-CSCF to S-CSCF procedures.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 7.2.2.1-6: INVITE request (MO#1a to S-S)

```
INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:pcscf1.visited1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

SDP

The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

7. 100 Trying (S-S to MO#1a) - see example in table 7.2.2.1-7 (related to table 7.2.2.1-6)

S-CSCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 7.2.2.1-7: 100 Trying (S-S to MO#1a)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. 183 Session Progress (S-S to MO#1a) - see example in table 7.2.2.1-8 (related to table 7.2.2.1-6)

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response (to 6), per the S-CSCF to S-CSCF procedures.

Table 7.2.2.1-8: 183 Session Progress (S-S to MO#1a)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.l@pcscf2.visited2.net, sip:764z87.l@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

9. 183 Session Progress (S-CSCF to P-CSCF) - see example in table 7.2.2.1-9

S-CSCF forwards the 183 Session Progress response to P-CSCF.

Table 7.2.2.1-9: 183 Session Progress (S-SCSF to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

Upon receiving the 183 Session Progress, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is - see example in table 7.2.2.1-9b.

Table 7.2.2.1-9b: Storage of information at P-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact(local): sip:[5555::aaa:bbb:ccc:ddd]
Route: sip:332b23.1@scscf1.home1.net, sip:764z87.1@scscf2.home2.net, pcscf2.visited2.net

```

10. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session.

11. 183 Session Progress (P-CSCF to UE) – see example in table 7.2.2.1-11

P-CSCF forwards the 183 Session Progress response to the originating endpoint.

Table 7.2.2.1-11: 183 Session Progress (P-CSCF to UE)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

P-CSCF removes the Record-Route and Via headers, calculates the proper Route header to add to future requests, and saves that information without passing it to the UE. The saved value of the Route header is:

```

Route: sip:332b23.1@scscf1.home1.net, sip:764z87.1@scscf2.home2.net,
      sip:pcscf2.visited2.net

```

Media-Authorization: a P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

12. PRACK (UE to P-CSCF) - see example in table 7.2.2.1-12

UE#1 determines which media flows should be used for this session, and which codecs should be used for each of those media flows. If there was any change in media flows, or if there was more than one choice of codec for a media flow, then UE#1 must include an SDP in the PRACK message sent to UE#2.

For this example, assume UE#1 chooses AMR as the codec to use for the single audio stream.

UE includes this information in the PRACK request to P-CSCF.

Editor's Note: The use of three-message codec negotiation (one round-trip to determine common capabilities, then originator picks the ones to use) is allowed by RFC2543, but will apparently not be supported by 2543bis. This inconsistency needs to be resolved.

Table 7.2.2.1-12: PRACK (UE to P-CSCF)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

Request-URI: takes the value of the Contact header of the received 183 Session Progress response.

Via: takes the value of either the IP address or FQDN of the originating UE.

From:/To:/Call-ID: copied from the 183 Session Progress response so that they include any tag parameter.

Cseq: takes a higher value than that in the previous request.

The final selection of the media stream from the set of those supported by the terminating endpoint, given in the received 183 Session Progress response (14), is made by the originating UE and included in the SDP.

13. PRACK (P-CSCF to S-CSCF) – see example in table 7.2.2.1-13

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the PRACK request to S-CSCF.

Table 7.2.2.1-13: PRACK (P-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net,
sip:361k21.1@pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: taken from the first component of the saved Route header.

Route: saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

14. PRACK (MO#1a to S-S) – see example in table 7.2.2.1-14

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.2.1-14: PRACK (MO#1a to S-S)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Request-URI: the first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

15. 200 OK (S-S to MO#1a) – see example in table 7.2.2.1-15 (related to table 7.2.2.1-14)

The destination endpoint responds to the PRACK request (14) with a 200 OK response, per the S-CSCF to S-CSCF procedures.

Table 7.2.2.1-15: 200 OK (S-S to MO#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

16. 200 OK (S-CSCF to P-CSCF) - see example in table 7.2.2.1-16

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.2.1-16: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

17. 200 OK (P-CSCF to UE) - see example in table 7.2.2.1-17

P-CSCF forwards the 200 OK response to UE.

Table 7.2.2.1-17: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

18. Resource Reservation

After determining the final media streams in step #11, UE initiates the reservation procedures for the resources needed for this session.

19. COMET (UE to P-CSCF) – see example in table 7.2.2.1-19

When the resource reservation is completed, UE sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The request is sent first to P-CSCF.

Table 7.2.2.1-19: COMET (UE to P-CSCF)

```
COMET sip:[5555::eee:fff:aaa:bbb]SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

Request-URI: takes the value of the Contact header of the received 183 Session Progress response.

Via: takes the value of either the IP address or FQDN of the originating UE.

From:/To:/Call-ID: copied from the 183 Session Progress response so that they include any tag parameters.

Cseq: takes a higher value than that in the previous request.

The SDP indicates that the resource reservation was successful.

20. COMET (P-CSCF to S-CSCF) – see example in table 7.2.2.1-20

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the COMET request to S-CSCF.

Table 7.2.2.1-20: COMET (P-CSCF to S-CSCF)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net,
sip:361k21.1@pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: taken from the first component of the saved Route header.

Route: saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

21. COMET (MO#1a to S-S) - see example in table 7.2.2.1-21

S-CSCF forwards the COMET request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.2.1-21: COMET (MO#1a to S-S)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: the first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

22. 200 OK (S-S to MO#1a) – see example in table 7.2.2.1-22 (related to table 7.2.2.1-21)

The destination endpoint responds to the COMET request (21) with a 200 OK, per the S-CSCF to S-CSCF procedures.

Table 7.2.2.1-22: 200 OK (S-S to MO#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

23. 200 OK (S-CSCF to P-CSCF) - see example in table 7.2.2.1-23

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.2.1-23: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

24. 200 OK (P-CSCF to UE) – see example in table 7.2.2.1-24

P-CSCF forwards the 200 OK response to UE.

Table 7.2.2.1-24: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

25. 180 Ringing (S-S to MO#1a) – see example in table 7.2.2.1-25 (related to table 7.2.2.1-6)

The called UE may optionally perform alerting. If so, it signals this to the calling party by a 180 Ringing provisional response to (6). This response is sent to S-CSCF per the S-CSCF to S-CSCF procedure.

Table 7.2.2.1-25: 180 Ringing (S-S to MO#1a)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

26. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

27. 180 Ringing (S-CSCF to P-CSCF) – see example in table 7.2.2.1-27

S-CSCF forwards the 180 Ringing response to P-CSCF.

Table 7.2.2.1-27: 180 Ringing (S-CSCF to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

28. 180 Ringing (P-CSCF to UE) - see example in table 7.1.1-28

P-CSCF removes the Record-Route headers.

P-CSCF forwards the 180 Ringing response to UE.

Table 7.2.2.1-28: 180 Ringing (P-CSCF to UE)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Editor's Note: Additional QoS interactions to handle one-way media at this point (e.g. for PSTN ringback and announcements) is for further study.

29. PRACK (UE to P-CSCF) – see example in table 7.2.2.1-29

UE indicates to the originating subscriber that the destination is ringing. It responds to the 180 Ringing provisional response (28) with a PRACK request.

Table 7.2.2.1-29: PRACK (UE to P-CSCF)

```
PRACK sip:[5555::eee:fff:aaa:bbb]SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

Request-URI: takes the value of the Contact header of the 180 Ringing response.

Via: takes the value of either the IP address or FQDN of the UE.

From:/To:/Call-ID: copied from the 180 Ringing response so that they include any revised tag parameters.

Cseq: takes a higher value than in the previous request.

30. PRACK (P-CSCF to S-CSCF) – see example in table 7.2.2.1-30

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the PRACK request to S-CSCF.

Table 7.2.2.1-30: PRACK (P-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net,
sip:361k21.1@pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

31. PRACK (MO#1a to S-S) - see example in table 7.2.2.1-31

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.2.1-31: PRACK (MO#1a to S-S)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

32. 200 OK (S-S to MO#1a) - see example in table 7.2.2.1-32 (related to table 7.2.2.1-31)

The destination endpoint responds to the PRACK request (31) with a 200 OK response.

Table 7.2.2.1-32: 200 OK (S-S to MO#1a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

33. 200 OK (S-CSCF to P-CSCF) - see example in table 7.2.2.1-33

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.2.1-33: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

34. 200 OK (P-CSCF to UE) – see example in table 7.2.2.1-34

P-CSCF forwards the 200 OK response to UE.

Table 7.2.2.1-34: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. 200 OK (S-S to MO#1a) – see example in table 7.2.2.1-35 (related to table 7.2.2.1-6)

When the called party answers, the terminating endpoint sends a 200 OK final response to the INVITE request (6), as specified by the termination procedures and the S-CSCF to S-CSCF procedures, to S-CSCF.

Table 7.2.2.1-35: 200 OK (S-S to MO#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.l@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net,
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

Upon receiving the 200 OK, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 7.2.2.1-35b.

Table 7.2.2.1-35b: Storage of information at S-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest):
sip:scscf2.home1.net,sip:%5b5555%3a%3aeeee%3afff%3aaaa%3abbb%5d@pcscf2.home1.net
Route(2orig): sip:%5b5555%3a%3aaaa%3abbb%3accc%3addd%5d@pcscf1.visited1.net
```

36. Service Control

S-CSCF performs whatever service control is appropriate for the completed session.

37. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.2.1-37

S-CSCF sends a 200 OK final response along the signalling path back to P-CSCF.

Table 7.2.2.1-37: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Types:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

38. Approval of QoS Commit

The P-CSCF approves the commitment of the QoS resources.

39. 200 OK (P-CSCF to UE) – see example in table 7.2.2.1-39

P-CSCF indicates the resources reserved for this session should now be committed, and forwards the 200 OK final response to the session originator. UE can start the media flow(s) for this session.

Table 7.2.2.1-39: 200 OK (P-CSCF to UE)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Types:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

40. ACK (UE to P-CSCF) – see example in table 7.2.2.1-40

UE starts the media flow for this session, and responds to the 200 OK (37) with an ACK request sent to P-CSCF.

Table 7.2.2.1-40: ACK (UE to P-CSCF)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgk490333
Cseq: 127 ACK
Content-Length: 0

```

Cseq: is required to be the same value as Cseq contained in original INVITE request [3].

41. ACK (P-CSCF to S-CSCF) – see example in table 7.2.2.1-41

P-CSCF forwards the ACK request to S-CSCF.

Table 7.2.2.1-41: ACK (P-CSCF to S-CSCF)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net,
sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Request-URI: the first component of the saved Route header.

Route: saved from the 200 OK response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

42. ACK (MO#1a to S-S) - see example in table 7.2.2.1-42

S-CSCF forwards the ACK request to the terminating endpoint, per the S-CSCF to S-CSCF procedure.

Table 7.2.2.1-42: ACK (MO#1a to S-S)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.2.2.2 Failure in termination procedure

The roaming subscriber that initiated a session with procedure MO#1a had the attempt fail due to an error detected in the Termination procedure or in the S-CSCF-to-S-CSCF procedure. This could be due to, for example, destination busy (error code 486), destination service denied (error code 403), destination currently out of coverage (error code 480), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, UE#1 could be at many different stages in the session establishment procedure. This is shown in figure 7.2.2.2-1, as optional messages 7-33 that may appear in this error procedure.

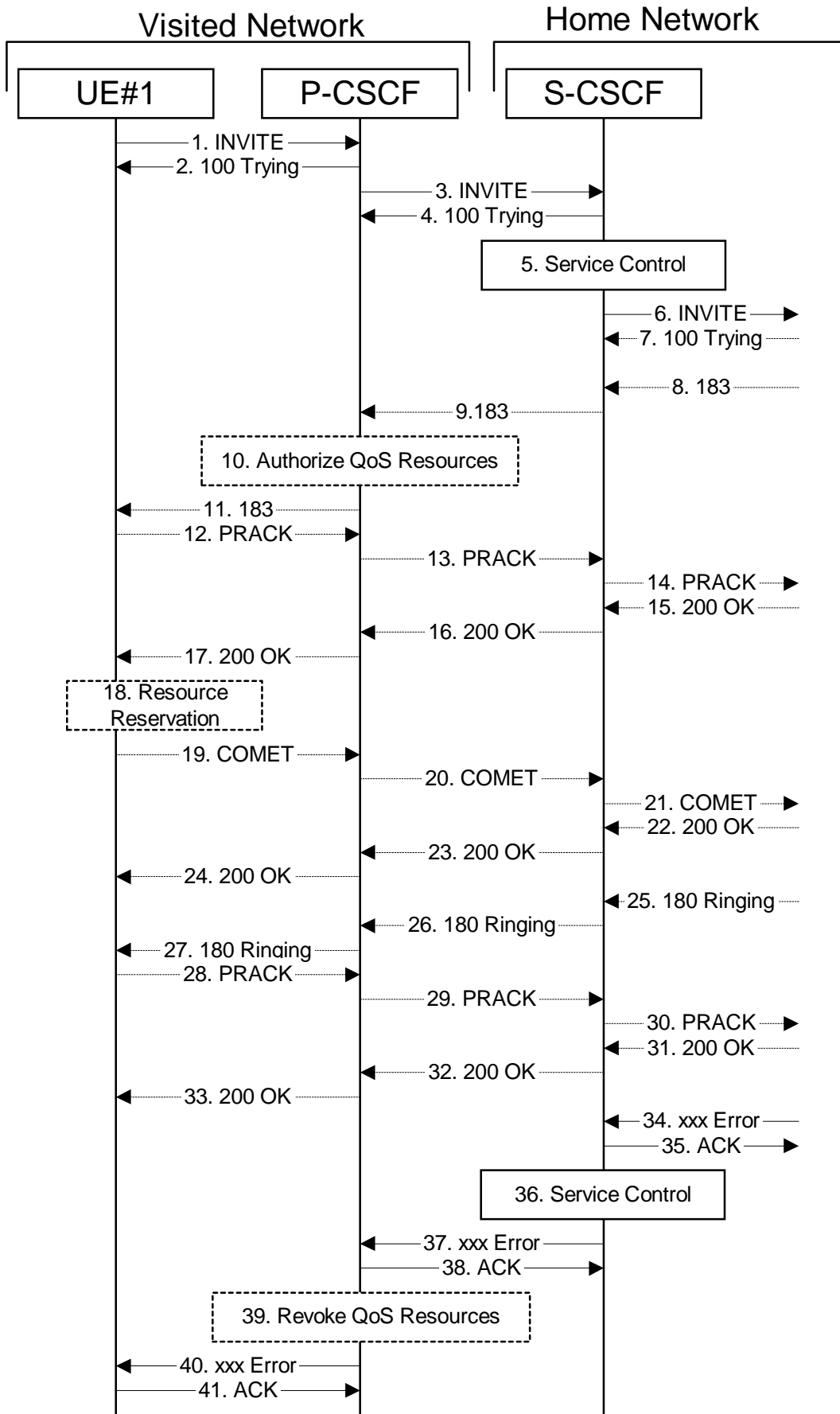


Figure 7.2.2.2-1: Failure in termination procedure

1-6. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.2.2.1.

7-33.100 Trying (S-S to MO#1a) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.2.1.

34. xxx Error (S-S to MO#1a) – see example in table 7.2.2.2-34

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.2.2-34: 486 Busy Here (S-S to MO#1a)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Contact: sip:%5b5555%3a%3ae%3aff%3aaa%3abbb%5d@pcscf2.home2.net
Call-ID:
CSeq: 127 INVITE
Retry-After: 3600
Content-Length: 0
```

35. ACK (MO#1a to S-S) - see example in table 7.2.2.2-35

Upon receive the 486 response from the S-S procedure, S-CSCF sends ACK.

Table 7.2.2.2-35: ACK (MO#1a to S-S)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

36. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

37. xxx Error (S-CSCF to P-CSCF) – see example in table 7.2.2.2-37 (related to table 7.2.2.2-34)

The S-CSCF returned a SIP error response to P-CSCF.

NOTE 2: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.2.2-37: 486 Busy Here (S-CSCF to P-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After: 3600
Content-Length: 0
```

38. ACK (P-CSCF to S-CSCF) – see example in table 7.2.2.2-38

Upon receive the 486 response from the S-CSCF procedure, P-CSCF sends ACK.

Table 7.2.2.2-38: ACK (P-CSCF to S-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf.home.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

39. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

40. xxx Error (P-CSCF to UE) – see example in table 7.2.2.2-40 (related to table 7.2.2.2-37)

The P-CSCF returned a SIP error response to UE.

NOTE 3: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.2.2-40: 486 Busy Here (P-CSCF to UE)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After: 3600
Content-Length: 0
```

41. ACK (P-CSCF to S-CSCF) – see example in table 7.2.2.2-41

Upon receive the 486 response from the P-CSCF, UE sends ACK.

Table 7.2.2.2-41: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.2.2.3 Session abandoned, or resource failure

The roaming subscriber that initiated a session with procedure MO#1a either abandoned the attempt, or was unable to obtain the resources necessary for the session. The signalling flow for this error handling is shown in figure 7.2.2.3-1.

If the session is aborted due to failure to obtain resources, it will occur at step #18 in the signalling flow; steps 19-33 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 8-33.

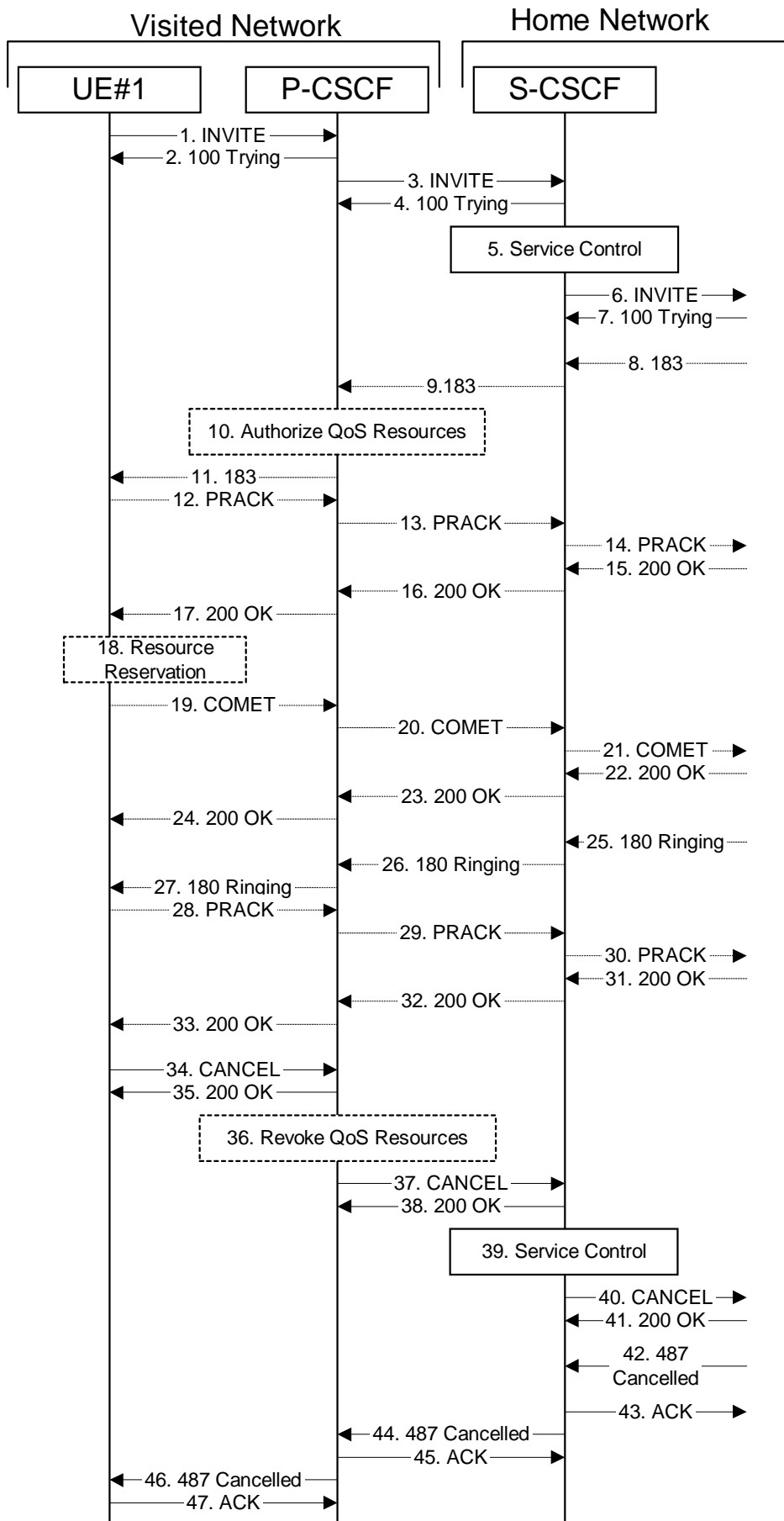


Figure 7.2.2.3-1: Session abandoned or resource failure

1-7. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.2.2.1.

8-33.183 Session Progress (S-S to MO#1a) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.2.1.

34. CANCEL (UE to P-CSCF) – see example in table 7.2.2.3-34

The UE cancelled the original INVITE request.

Table 7.2.2.3-34: CANCEL (UE to P-CSCF)

```
CANCEL sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0
```

35. 200 OK (P-CSCF to UE) – see example in table 7.2.2.3-35

Upon receive the CANCEL request from the UE, P-CSCF sends 200 OK.

Table 7.2.2.3-35: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

36. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

37. CANCEL (P-CSCF to S-CSCF) – see example in table 7.2.2.3-37

The P-CSCF forwards the CANCEL request to S-CSCF.

Table 7.2.2.3-37: CANCEL (P-CSCF to S-CSCF) (related to table 7.2.2.3-34)

```
CANCEL sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcsfc1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaa%3abbb%3acc%3add%5d@pcsfc1.visited1.net
Content-Length:
```

Editor's Note: Need to check whether P-CSCF should modify the Contact: header in the CANCEL.

Editor's Note: Need to check whether P-CSCF should insert a Route: header in the CANCEL

38. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.2.3-38

Upon receiving the CANCEL request from the P-CSCF, S-CSCF sends 200 OK.

Table 7.2.2.3-38: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

39. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

40. CANCEL (S-CSCF to S-S) – see example in table 7.2.2.3-40 (related to table 7.2.2.3-37)

The S-CSCF forwards the CANCEL request to the appropriate S-CSCF-to-S-CSCF procedure.

Table 7.2.2.3-40: CANCEL (S-CSCF to S-S)

```
CANCEL sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

Editor's Note: Need to check whether a proxy inserts a Record-Route in a CANCEL request.

41. 200 OK (S-S to S-CSCF) – see example in table 7.2.2.3-41

Upon receive the CANCEL request from the S-CSCF, the next hop (whatever it is) sends 200 OK.

Table 7.2.2.3-41: 200 OK (S-S to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

42. 487 Cancelled (S-S to MO#1a) – see example in table 7.2.2.3-42

The termination procedure cancelled the request, and returned a SIP error response to the original INVITE request.

Table 7.2.2.3-42: 487 Cancelled (S-S to MO#1a)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact: sip:%5b5555%3a%3aeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
Call-ID:
CSeq: 127 INVITE
Content-Length: 0
```

43. ACK (MO#1a to S-S) - see example in table 7.2.2.3-43

Upon receive the 487 response from the S-S procedure, S-CSCF sends ACK.

Table 7.2.2.3-43: ACK (MO#1a to S-S)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

44. 487 Cancelled (S-CSCF to P-CSCF) - see example in table 7.2.2.3-44 (related to table 7.2.2.3-42)

The S-CSCF returned the SIP error response to P-CSCF.

Table 7.2.2.3-44: 487 Cancelled (S-CSCF to P-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Content-Length: 0
```

45. ACK (P-CSCF to S-CSCF) - see example in table 7.2.2.3-45

Upon receive the 487 response from the S-CSCF, P-CSCF sends ACK.

Table 7.2.2.3-45: ACK (P-CSCF to S-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf.home.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

46. 487 Cancelled (P-CSCF to UE) - see example in table 7.2.2.3-46 (related to table 7.2.2.3-44)

The P-CSCF returned a SIP error response to UE.

Table 7.2.2.3-46: 487 Cancelled (P-CSCF to UE)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After: 3600
Content-Length: 0
```

47. ACK (UE to P-CSCF) – see example in table 7.2.2.3-47

Upon receive the 487 response from the P-CSCF, UE sends ACK.

Table 7.2.2.3-47: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.2.3 MO#2

7.2.3.1 (MO#2) Mobile origination, located in home network (S-S#2, MT#2 assumed)

Figure 7.2.3.1-1 shows an origination procedure which applies to subscribers located in their home service area.

The UE is located in the home network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates an S-CSCF in the home network.

When registration is complete, the P-CSCF knows the name/address of S-CSCF.

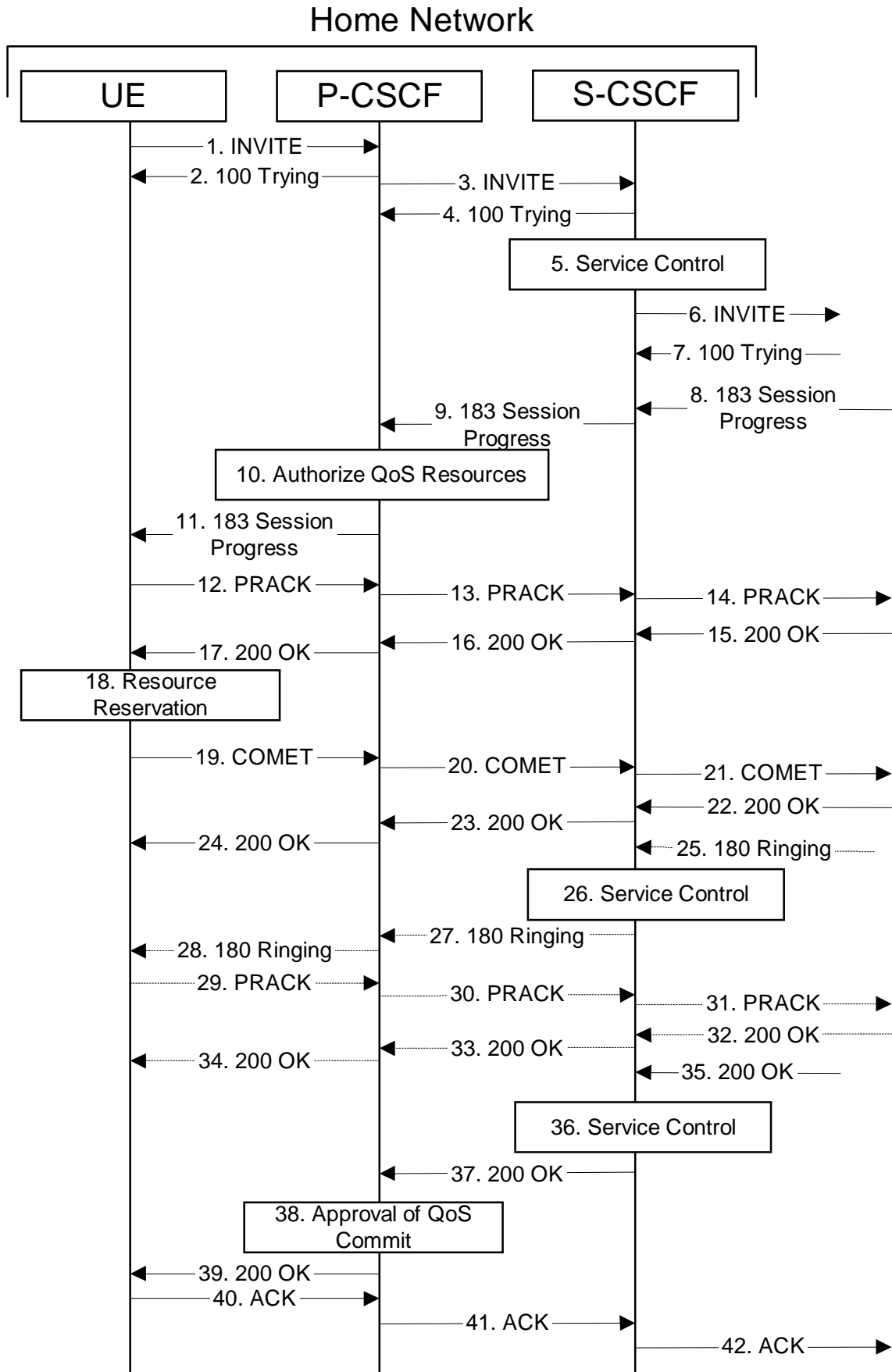


Figure 7.2.3.1-1: MO#2

Procedure MO#2 is as follows:

1. **INVITE (UE to P-CSCF) - see example in table 7.2.3.1-1**

UE#1 determines the complete set of codecs that it is capable of supporting for this session. It builds a SDP containing bandwidth requirements and characteristics of each, and assigns local port numbers for each possible media flow. Multiple media flows may be offered, and for each media flow (m= line in SDP), there may be multiple codec choices offered.

For this example, assume UE#1 is capable of sending two simultaneous video streams, either H261 or MPV format, and two simultaneous audio streams, either AMR, G726-32, PCMU, or G728.

UE sends the INVITE request, containing an initial SDP, to the P-CSCF determined via the CSCF discovery mechanism.

Table 7.2.3.1-1: INVITE (UE to P-CSCF)

```

INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 98 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

Request-URI: contains the keyed number from the user. This is specified by the UE as sip:<keyed number>@home1.net. This is in accordance to standard IETF procedures for specifying dialled digits.

Via: contains the IP address or FQDN of the originating UE.

Remote-Party-ID: contains the public user identity. The Display name is optional.

From:/To:/Call-ID: follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.

Cseq: A random starting number.

- Contact:** The IP address or FQDN of the originating UE.
- SDP** The SDP contains a set of codecs supported by UE#1 and desired by the user at UE#1 for this session.

Upon receiving the INVITE, the P-CSCF stores the following information about this session, for use in possible error recovery actions – see example in table 7.2.3.1-1b:

Table 7.2.3.1-1b: Storage of information at P-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
```

2. 100 Trying (P-CSCF to UE) – see example in table 7.2.3.1-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.2.3.1-2: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. INVITE (P-CSCF to S-CSCF) – see example in table 7.2.3.1-3

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes the Request-URI header in the request. This next hop is the S-CSCF within the home network of UE#1.

P-CSCF adds itself to the Record-Route header and Via header.

P-CSCF#1 examines the media parameters, and removes any choices that the network operator decides based on local policy, not to allow on the network.

For this example, assume the network operator disallows H261 video encoding.

The INVITE request is forwarded to the S-CSCF.

Table 7.2.3.1-3: INVITE (P-CSCF to S-CSCF)

```
INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 3400 RTP/AVP 99
```

```

b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Request-URI: The first component in the remembered Path header from Registration.

Route: Contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams no longer list code 98 (H261).

Upon receiving the INVITE, the S-CSCF stores the following information about this session, for use in possible error recovery actions – see example in table 7.2.3.1-3b:

Table 7.2.3.1-3b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact (local): sip:[5555::aaa:bbb:ccc:ddd]

```

4. 100 Trying (S-CSCF to P-CSCF) - see example in table 7.2.3.1-4

S-CSCF responds to the INVITE request (3) with a 100 Trying provisional response.

Table 7.2.3.1-4: 100 Trying (S-CSCF to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

5. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

6. INVITE (MO#2 to S-S) – see example in table 7.2.3.1-6

S-CSCF forwards the INVITE request, as specified by the S-CSCF to S-CSCF procedures.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 7.2.3.1-6: INVITE (MO#2 to S-S)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

7. 100 Trying (S-S to MO#2) – see example in table 7.2.3.1-7

S-CSCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 7.2.3.1-7: 100 Trying (S-S to MO#2)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. 183 Session Progress (S-S to MO#2) – see example in table 7.2.3.1-8

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response (to (6)), per the S-CSCF to S-CSCF procedures.

Table 7.2.3.1-8: 183 Session Progress (S-S to MO#2)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15

```

9. 183 Session Progress (S-CSCF to P-CSCF) – see example in table 7.2.3.1-9

S-CSCF forwards the 183 Session Progress response to P-CSCF.

Table 7.2.3.1-9: 183 Session Progress (S-CSCF to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

Upon receiving the 183 Session Progress, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is – see example in table 7.2.3.1-9b:

Table 7.2.3.1-9b: Storage of information at P-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact (local): sip:[5555::aaa:bbb:ccc:ddd]
Route: sip:332b23.1@scscf1.home1.net, sip:764z87.1@scscf2.home2.net,
sip:876t12.1@pcscf2.home2.net
```

10. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session

11. 183 Session Progress (P-CSCF to UE) – see example in table 7.2.3.1-11

P-CSCF forwards the 183 Session Progress response to the originating endpoint.

Table 7.2.3.1-11: 183 Session Progress (P-CSCF to UE)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
```

Media-Authorization: a P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

12. PRACK (UE to P-CSCF) – see example in table 7.2.3.1-12

UE#1 determines which media flows should be used for this session, and which codecs should be used for each of those media flows. If there was any change in media flows, or if there was more than one choice of codec for a media flow, then UE#1 must include an SDP in the PRACK request sent to UE#2).

For this example, assume UE#1 chooses AMR as the codec to use for the single audio stream.

UE includes this information in the PRACK request to P-CSCF.

Table 7.2.3.1-12: PRACK (UE to P-CSCF)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgklkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

- Request-URI:** Takes the value of the Contact header of the received 183 Session Progress response.
- Via:** Takes the value of either the IP address of FQDN of the originating UE.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameter.
- Cseq:** Takes a higher value than that in the previous request.

The final selection of the media stream from the set of those supported by the terminating endpoint, given in the received 183 Session Progress response (14), is made by the originating UE and included in the SDP.

13. PRACK (P-CSCF to S-CSCF) – see example in table 7.2.3.1-13

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the PRACK request to S-CSCF.

Table 7.2.3.1-13: PRACK (P-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

- Request-URI:** The first component of the saved Route header.

Route: saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

14. PRACK (MO#2 to S-S) – see example in table 7.2.3.1-14

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.3.1-14: PRACK (MO#2 to S-S)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Request-URI: The first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

15. 200 OK (S-S to MO#2) – see example in table 7.2.3.1-15

The destination endpoint responds to the PRACK request (14) with a 200 OK response, per the S-CSCF to S-CSCF procedures.

Table 7.2.3.1-15: 200 OK (S-S to MO#2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

16. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.3.1-16

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.3.1-16: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

17. 200 OK (P-CSCF to UE) – see example in table 7.2.3.1-17

P-CSCF forwards the 200 OK response to UE.

Table 7.2.3.1-17: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

18. Resource Reservation

After determining the final media streams in step #11, UE initiates the reservation procedures for the resources needed for this session.

19. COMET (UE to P-CSCF) – see example in table 7.2.3.1-19

When the resource reservation is completed, UE sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The request is sent first to P-CSCF.

Table 7.2.3.1-19: COMET (UE to P-CSCF)

```
COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>; tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

- Request-URI:** Takes the value of the Contact header of the received 183 Session Progress response.
- Via:** Takes the value of either the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameters.
- CSeq:** Takes a higher value than that in the previous request.

The SDP indicates that the resource reservation was successful.

20. COMET (P-CSCF to S-CSCF) – see example in table 7.2.3.1-20

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the COMET request to S-CSCF.

Table 7.2.3.1-20: COMET (P-CSCF to S-CSCF)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: the first component of the saved Route header.

Route: saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

21. COMET (MO#2 to S-S) – see example in table 7.2.3.1-21

S-CSCF forwards the COMET request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.3.1-21: COMET (MO#2 to S-S)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: the first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

22. 200 OK (S-S to MO#2) – see example in table 7.2.3.1-22

The destination endpoint responds to the COMET request (21) with a 200 OK, per the S-CSCF to S-CSCF procedures.

Table 7.2.3.1-22: 200 OK (S-S to MO#2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

23. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.3.1-23

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.3.1-23: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

24. 200 OK (P-CSCF to UE) – see example in table 7.2.3.1-24

P-CSCF forwards the 200 OK response to UE.

Table 7.2.3.1-24: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

25. 180 Ringing (S-S to MO#2) - see example in table 7.2.3.1-25

The called UE may optionally perform alerting. If so, it signals this to the calling party by a 180 Ringing provisional response to (6). This response is sent to S-CSCF per the S-CSCF to S-CSCF procedure.

Table 7.2.3.1-25: 180 Ringing (S-S to MO#2)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

26. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

27. 180 Ringing (S-CSCF to P-CSCF) – see example in table 7.2.3.1-27

S-CSCF forwards the 180 Ringing response to P-CSCF.

Table 7.2.3.1-27: 180 Ringing (S-CSCF to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

28. 180 Ringing (P-CSCF to UE) – see example in table 7.2.3.1-28

P-CSCF removes the Record-Route headers.

P-CSCF forwards the 180 Ringing response to UE.

Table 7.2.3.1-28: 180 Ringing (P-CSCF to UE)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Editor's Note: Additional QoS interactions to handle one-way media at this point (e.g. for PSTN ringback and announcements) is for further study.

29. PRACK (UE to P-CSCF) – see example in table 7.2.3.1-29

UE indicates to the originating subscriber that the destination is ringing. It acknowledges the 180 Ringing provisional response (27) with a PRACK request.

Table 7.2.3.1-29: PRACK (UE to P-CSCF)

```
PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

Request-URI: Takes the value of the Contact header of the 180 Ringing response.

Via: Takes the value of either the IP address or FQDN of the UE.

From:/To:/Call-ID: Copied from the 180 Ringing response so that they include any revised tag parameters.

Cseq: Takes a higher value than in the previous request.

30. PRACK (P-CSCF to S-CSCF) – see example in table 7.2.3.1-30

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the PRACK request to S-CSCF.

Table 7.2.3.1-30: PRACK (P-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

31. PRACK (MO#2 to S-S) – see example in table 7.2.3.1-31

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 7.2.3.1-31: PRACK (MO#2 to S-S)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

32. 200 OK (S-S to MO#2) – see example in table 7.2.3.1-32

The destination endpoint responds to the PRACK request (31) with a 200 OK response.

Table 7.2.3.1-32: 200 OK (S-S to MO#2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

33. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.3.1-33

S-CSCF forwards the 200 OK response to P-CSCF.

Table 7.2.3.1-33: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

34. 200 OK (P-CSCF to UE) – see example in table 7.2.3.1-34

P-CSCF forwards the 200 OK response to UE.

Table 7.2.3.1-34: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. 200 OK (S-S to MO#2) – see example in table 7.2.3.1-35

When the called party answers, the terminating endpoint sends a 200 OK final response to the INVITE request (6), as specified by the termination procedures and the S-CSCF to S-CSCF procedures, to S-CSCF.

Table 7.2.3.1-35: 200 OK (S-S to MO#2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

Upon receiving the 200 OK, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 7.2.3.1-35b.

Table 7.2.3.1-35b: Storage of information at S-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:scscf2.home2.net,sip:pcscf2.home2.net
Route(2orig): sip:pcscf1.home1.net
```

36. Service Control

S-CSCF performs whatever service control is appropriate for the completed session

37. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.3.1-37

S-CSCF sends a 200 OK final response along the signalling path back to P-CSCF.

Table 7.2.3.1-37: 200 OK (S-CSCF to P-CSCF)

<pre> SIP/2.0 200 OK Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd] Record-Route: From: To: Call-ID: CSeq: Contact: Content-Types: Content-Length: v= o= s= c= t= m= m= m= b= a= a= a= m= </pre>

38. Approval of QoS Commit

The P-CSCF approves the commitment of the QoS resources

39. 200 OK (P-CSCF to UE) – see example in table 7.2.3.1-39

P-CSCF indicates the resources reserved for this session should now be committed, and forwards the 200 OK final response to the session originator. UE can start media flow(s) for this session.

Table 7.2.3.1-39: 200 OK (P-CSCF to UE)

<pre> SIP/2.0 200 OK Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd] From: To: Call-ID: CSeq: Contact: Content-Type: Content-Length: v= o= s= c= t= m= m= m= b= a= a= a= m= </pre>
--

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

40. ACK (UE to P-CSCF) – see example in table 7.2.3.1-40

UE starts the media flow for this session, and responds to the 200 OK (39) with an ACK request sent to P-CSCF.

Table 7.2.3.1-40: ACK (UE to P-CSCF)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

Cseq: Is required to be the same value as Cseq is original INVITE request [3].

41. ACK (P-CSCF to S-CSCF) – see example in table 7.2.3.1-41

P-CSCF forwards the ACK request to S-CSCF.

Table 7.2.3.1-41: ACK (P-CSCF to S-CSCF)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200 OK response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

42. ACK (MO#2 to S-S) – see example in table 7.2.3.1-42

S-CSCF forwards the ACK request to the terminating endpoint, per the S-CSCF to S-CSCF procedure.

Table 7.2.3.1-42: ACK (MO#2 to S-S)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.2.3.2 Failure in termination procedure

The roaming subscriber that initiated a session with procedure MO#2 had the attempt fail due to an error detected in the Termination procedure or in the S-CSCF-to-S-CSCF procedure. This could be due to, for example, destination busy (error code 486), destination service denied (error code 403), destination currently out of coverage (error code 480), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, UE#1 could be at many different stages in the session establishment procedure. This is shown in figure 7.2.3.2-1, as optional messages 7-33 that may appear in this error procedure.

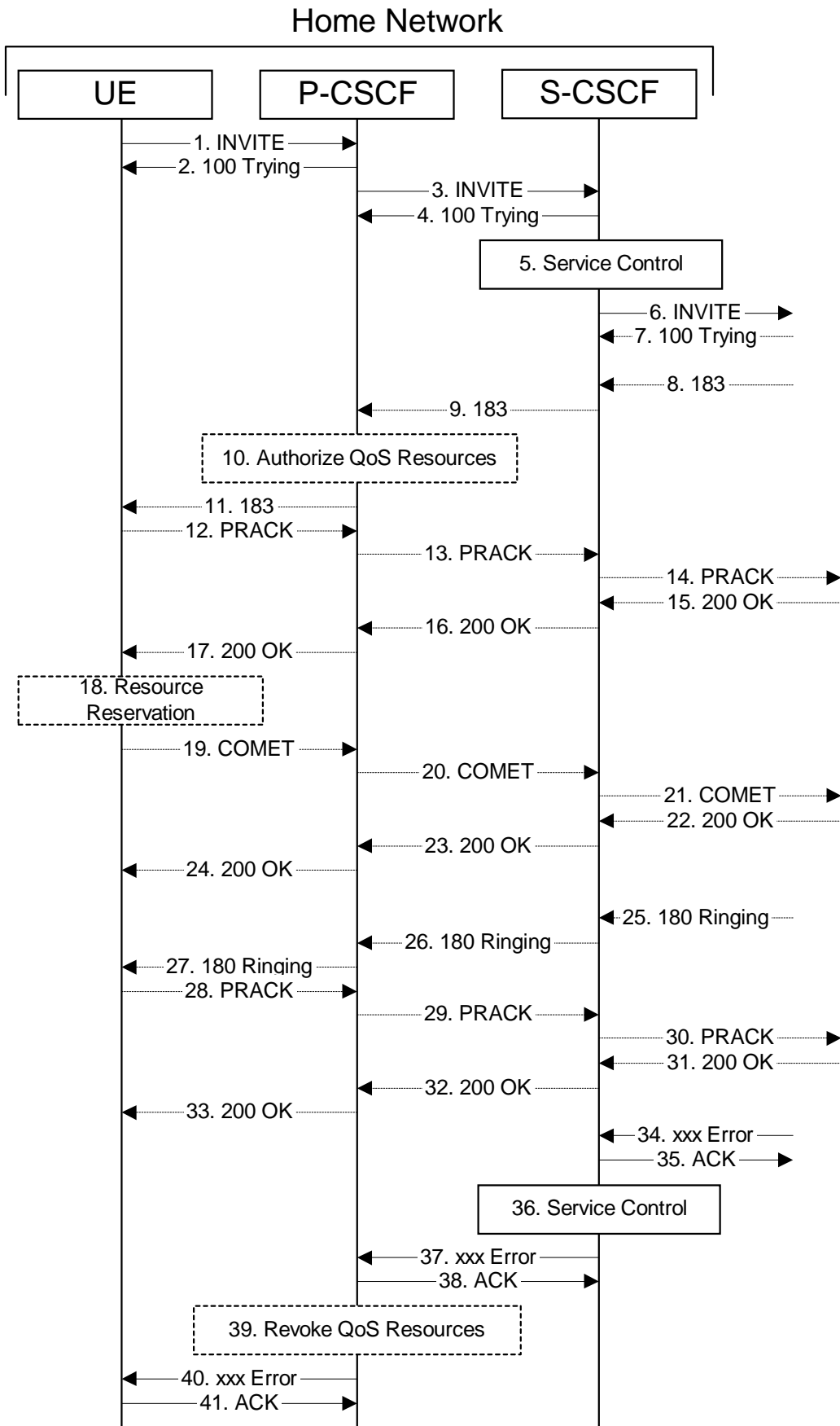


Figure 7.2.3.2-1: Failure in termination procedure

1-6. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.2.3.1.

7-33.100 Trying (S-S to MO#2) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.3.1.

34. xxx Error (S-S to MO#2) – see example in table 7.2.3.2-34

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.3.2-34: 486 Busy Here (S-S to MO#2)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

35. ACK (MO#2 to S-S) – see example in table 7.2.3.2-35

Upon receive the 486 response from the S-S procedure, S-CSCF sends ACK.

Table 7.2.3.2-35: ACK (MO#2 to S-S)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

36. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

37. xxx Error (S-CSCF to P-CSCF) – see example in table 7.2.3.2-37 (related to table 7.2.3.2-34)

The S-CSCF returned a SIP error response to P-CSCF.

NOTE 2: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.3.2-37: 486 Busy Here (S-CSCF to P-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

38. ACK (P-CSCF to S-CSCF) – see example in table 7.2.3.2-38

Upon receive the 486 response from the S-CSCF procedure, P-CSCF sends ACK.

Table 7.2.3.2-38: ACK (P-CSCF to S-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

39. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

40. xxx Error (P-CSCF to UE) – see example in table 7.2.3.2-40 (related to table 7.2.3.2-37)

The P-CSCF returned a SIP error response to UE.

NOTE 3: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.3.2-40: 486 Busy Here (P-CSCF to UE)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

41. ACK (P-CSCF to S-CSCF) – see example in table 7.2.3.2-41

Upon receive the 486 response from the P-CSCF, UE sends ACK.

Table 7.2.3.2-41: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.2.3.3 Session abandoned, or resource failure

The roaming subscriber that initiated a session with procedure MO#2 either abandoned the attempt, or was unable to obtain the resources necessary for the session. The signalling flow for this error handling is shown in figure 7.2.3.3-1.

If the session is aborted due to failure to obtain resources, it will occur at step #18 in the signalling flow; steps 19-33 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 8-33.

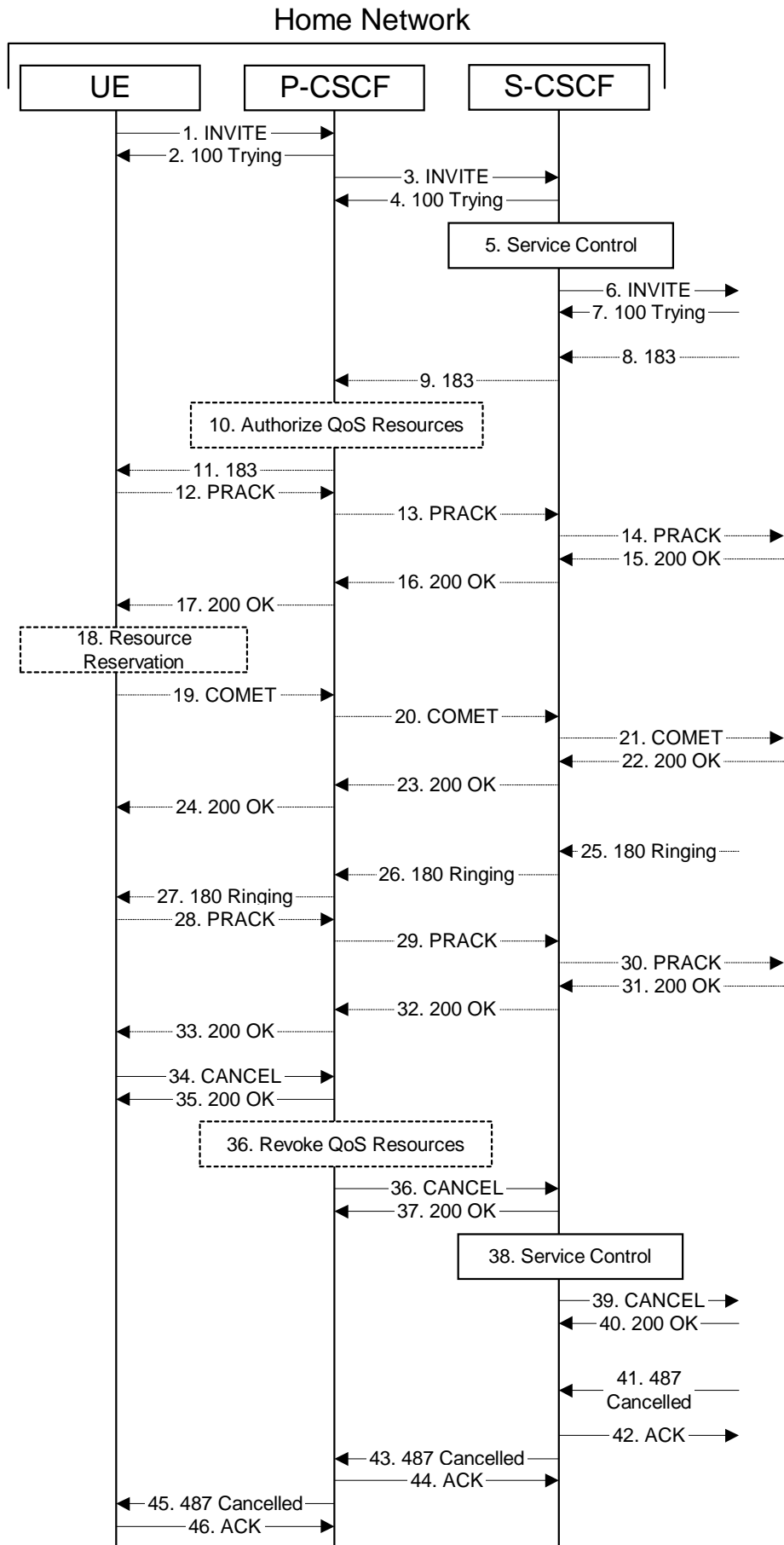


Figure 7.2.3.3-1: Session abandoned or resource failure

1-7. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.2.3.1.

8-33.183 Session Progress (S-S to MO#2) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.3.1.

34. CANCEL (UE to P-CSCF) – see example in table 7.2.3.3-34

The UE cancelled the original INVITE request.

Table 7.2.3.3-34: CANCEL (UE to P-CSCF)

```
CANCEL sip:[5555::eee:fff:aaa:bbb];user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Content-Length: 0
```

35. 200 OK (P-CSCF to UE) – see example in table 7.2.3.3-35

Upon receive the CANCEL request from the UE, P-CSCF sends 200 OK.

Table 7.2.3.3-35: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

36. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

37. CANCEL (P-CSCF to S-CSCF) – see example in table 7.2.3.3-37 (related to table 7.2.3.3-34)

The P-CSCF forwards the CANCEL request to S-CSCF.

Table 7.2.3.3-37: CANCEL (P-CSCF to S-CSCF)

```
CANCEL sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

38. 200 OK (S-CSCF to P-CSCF) – see example in table 7.2.3.3-38

Upon receiving the CANCEL request from the P-CSCF, S-CSCF sends 200 OK.

Table 7.2.3.3-38: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

39. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

40. CANCEL (S-CSCF to S-S) – see example in table 7.2.3.3-40 (related to table 7.2.3.3-37)

The S-CSCF forwards the CANCEL request to the appropriate S-CSCF-to-S-CSCF procedure.

Table 7.2.3.3-40: CANCEL (S-CSCF to S-S)

```
CANCEL sip:scscf2.home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

41. 200 OK (S-S to S-CSCF) – see example in table 7.2.3.3-41

Upon receive the CANCEL request from the S-CSCF, the next hop (whatever it is) sends 200 OK.

Table 7.2.3.3-41: 200 OK (S-S to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

42. 487 Cancelled (S-S to MO#2) – see example in table 7.2.3.3-42

The termination procedure cancelled the request, and returned a SIP error response to the original INVITE request.

Table 7.2.3.3-42: 487 Cancelled (S-S to MO#2)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID:
CSeq: 127 INVITE
Content-Length: 0
```

43. ACK (MO#2 to S-S) – see example in table 7.2.3.3-43

Upon receive the 487 response from the S-S procedure, S-CSCF sends ACK.

Table 7.2.3.3-43: ACK (MO#2 to S-S)

```

ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

44. 487 Cancelled (S-CSCF to P-CSCF) – see example in table 7.2.3.3-44 (related to table 7.2.3.3-42)

The S-CSCF returned the SIP error response to P-CSCF.

Table 7.2.3.3-44: 487 Cancelled (S-CSCF to P-CSCF)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Content-Length: 0

```

45. ACK (P-CSCF to S-CSCF) – see example in table 7.2.3.3-45

Upon receive the 487 response from the S-CSCF, P-CSCF sends ACK.

Table 7.2.3.3-45: ACK (P-CSCF to S-CSCF)

```

ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf.home.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

46. 487 Cancelled (P-CSCF to UE) – see example in table 7.2.3.3-46 (related to table 7.2.3.3-44)

The P-CSCF returned a SIP error response to UE.

Table 7.2.3.3-46: 487 Cancelled (P-CSCF to UE)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0

```

47. ACK (UE to P-CSCF) – see example in table 7.2.3.3-47

Upon receive the 487 response from the P-CSCF, UE sends ACK.

Table 7.2.3.3-47: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.2.4 (CS-O) CS Networks origination

The MGCF in the IM subsystem is a SIP endpoint that initiates requests on behalf of the CS Networks origination and Media Gateway. The subsequent nodes consider the signalling as if it came from a S-CSCF. The MGCF incorporates the network security functionality of the S-CSCF. This MGCF does not invoke Service Control, as this may be carried out in the CS Networks or at the terminating S-CSCF. This origination procedure can be used for any of the MT procedures.

Due to routing of sessions within the CS Networks, this origination procedure will only occur in the home network of the destination subscriber. However, the destination subscriber may be roaming in a different operator's network. Further, due to cases of session forwarding and electronic surveillance, the destination of the session through the IM subsystem may actually be another CS Networks termination.

7.2.4.1 CS Networks originated sessions routed towards IM CN subsystem (through MGCF) (S-S#2, MT#2 assumed)

This clause and figure 7.2.4.1-1 presents only the case of CS Networks originated sessions routed towards the IM CN subsystem reaching first a MGCF.

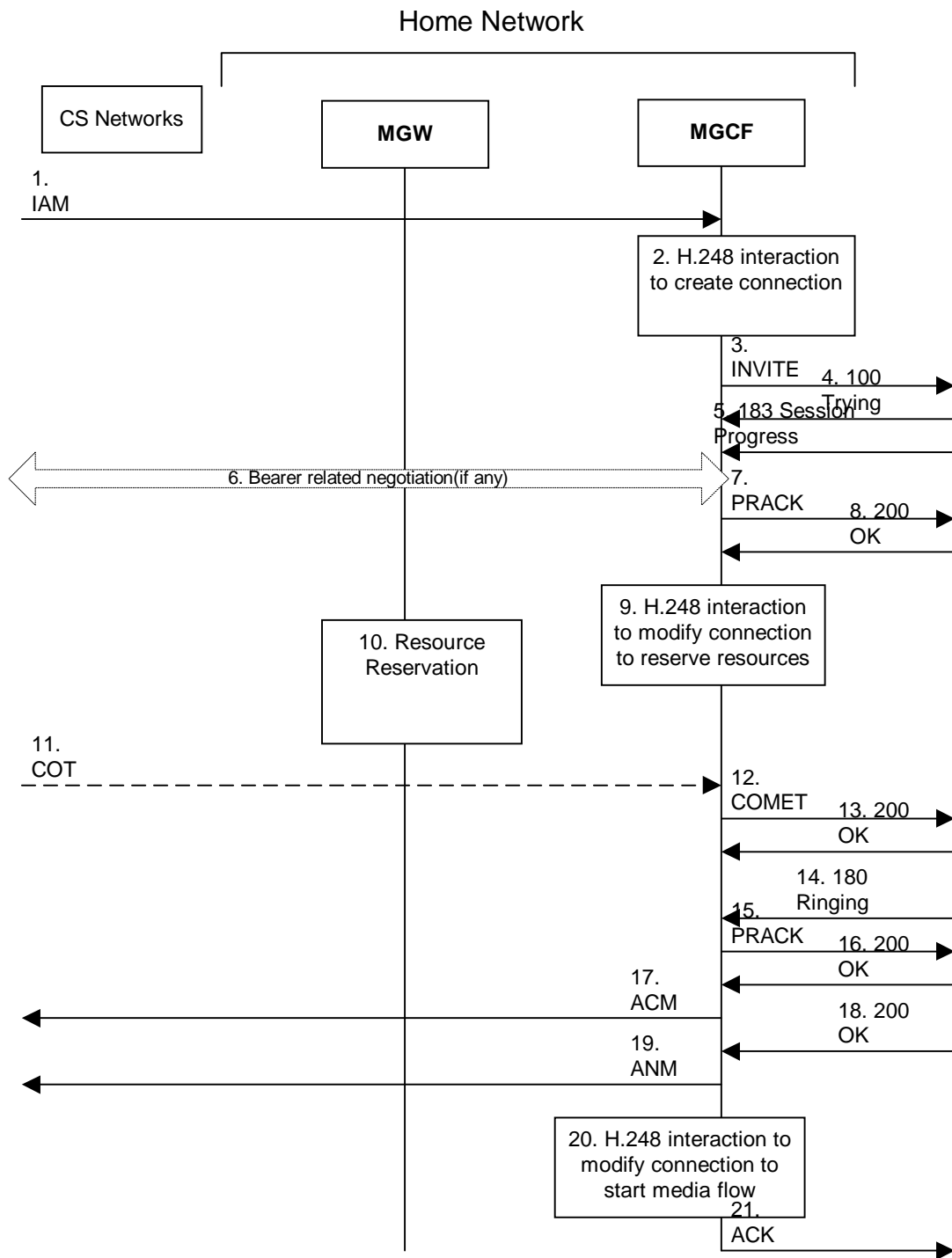


Figure 7.2.4.1-1: CS Networks origination

The CS Networks Origination procedure is as follows:

1. SS7: IAM

The CS Network establishes a bearer path to the MGW, and signals to the MGCF with a IAM message, giving the trunk identity, destination information and optionally the continuity indication.

2. H.248 Interaction

The MGCF initiates a H.248 command, to seize the trunk and an IP port.

3. INVITE (CS-O to S-S) – see example in table 7.2.4.1-3

The MGCF initiates an INVITE request, containing an initial SDP, as per the proper S-CSCF to S-CSCF procedure.

Table 7.2.4.1-3: INVITE (CS-O to S-S)

```

INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: <sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip: mgcf1.home1.net
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

- Request-URI:** Contains the keyed number from the user, as obtained from CS Networks signalling.
- Via:** Contains the IP address or FQDN of the originating MGCF.
- Remote-Party-ID:** Contains the identity of the originator. The Display name is optional.
- From:/To:/Call-ID:** Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
- Cseq:** A random starting number.
- Contact:** Is the SIP URL that contains the IP address or FQDN of the originating UE.
- SDP** The SDP contains a preconfigured set of codecs supported by the MGW.

4. 100 Trying (S-S to CS-O) – see example in table 7.2.4.1-4

MGCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 7.2.4.1-4: 100 Trying (S-S to CS-O)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

5. 183 Session Progress (S-S to CS-O) – see example in table 7.2.4.1-5

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response, per the S-CSCF to S-CSCF procedures.

Table 7.2.4.1-5: 183 Session Progress (S-S to CS-O)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP mgcf1.home1.net
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm

```

MGCF calculates the proper Route header to add to future requests, and saves that information. The saved value of the Route header is:

```
Route: sip:scscf2.home1.net, sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
```

6. Possible bearer related negotiation takes place

Steps 6 and 7 can be done in an arbitrary order.

7. PRACK (CS-O to S-S) – see example in table 7.2.4.1-7

MGCF decides the final set of media streams for this session, and includes this information in the PRACK request, send to the destination per the S-CSCF to S-CSCF procedures.

Table 7.2.4.1-7: PRACK (CS-O to S-S)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv

```

Request-URI: Takes the first component of the saved Route header.

- Via:** Takes the value of either the IP address or FQDN of the originating MGCF.
- Route:** Takes the saved Route header without the first component.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameter.
- Cseq:** Takes a higher value than that in the previous request.

The final selection of the media stream from the set of those supported by the terminating endpoint, given in the received 183 Session Progress response (5), is made by the originating MGCF and included in the SDP.

8. 200 OK (S-S to CS-O) – see example in table 7.2.4.1-8

The destination responds to the PRACK request (6) with a 200 OK response.

Table 7.2.4.1-8: 200OK (S-S to CS-O)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

9. H.248 Interaction

MGCF initiates a H.248 command to modify the connection parameters and instruct the MGW to reserve the resources needed for the session.

10. Reserve Resources

MGW reserves the resources needed for the session

11. COT

In case the IAM had contained a continuity indication, the COT message arrives to the MGCF.

12. COMET (CS-O to S-S) – see example in table 7.2.4.1-12

When the resource reservation is completed and the possible COT message is received, MGCF sends the COMET request to the terminating endpoint, per the S-S procedures.

Table 7.2.4.1-12: COMET (CS-O to S-S)

```
COMET sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
```

- Request-URI:** The first component of saved the Route header.
- Via:** Contains the IP address or FQDN of the originating MGCF.

- Route:** Takes the saved Route header without the first component.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameters.
- Cseq:** Takes a higher value than that in the previous request.

The SDP indicates that the resource reservation was successful.

13. 200 OK (S-S to CS-O) – see example in table 7.2.4.1-13

The destination endpoint responds to the COMET request (10) with a 200 OK response.

Table 7.2.4.1-13: 200 OK (S-S to CS-O)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

14. 180 Ringing (S-S to CS-O) – see example in table 7.2.4.1-14

The destination endpoint may optionally perform alerting. If so, it signals this to the calling party by a 180 Ringing provisional response. This response is sent to MGCF per the S-CSCF to S-CSCF procedure.

Table 7.2.4.1-14: 180 Ringing (S-S to CS-O)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP mgcf1.home1.net
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

15. PRACK (CS-O to S-S) – see example in table 7.2.4.1-15

MGCF acknowledges the 180 Ringing provisional response (12) with a PRACK request. MGCF adds the Route header corresponding to the session.

Table 7.2.4.1-15: PRACK (CS-O to S-S)

```
PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID:
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

16. 200 OK (S-S to CS-O) – see example in table 7.2.4.1-16

The destination endpoint responds to the PRACK request (13) with a 200 OK response.

Table 7.2.4.1-16: 200 OK (S-S to CS-O)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

17. SS7: ACM

If alerting is being performed, the MGCF forwards an ACM message.

18. 200 OK (S-S to CS-O) – see example in table 7.2.4.1-18

When the called party answers, the terminating and S-S procedures result in a 200 OK final response being sent to MGCF.

Table 7.2.4.1-18: 200 OK (S-S to CS-O)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP mgcf1.home1.net
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
```

19. SS7: ANM

MGCF forwards an ANM message to the CS Networks.

20. H.248: Interaction

MGCF initiates a H.248 command to alter the connection at MGW to make it bidirectional.

21. ACK (CS-O to S-S) – see example in table 7.2.4.1-21

MGCF acknowledges the 200 OK final response (16) with an ACK request.

Table 7.2.4.1-21: ACK (CS-O to S-S)

```
ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0
```

Request-URI: the first component of the saved Route header.

Route: takes the saved Route header without the first component.

Cseq: is required to be the same value as Cseq is original INVITE request [3]

7.2.4.2 CS Networks originated sessions routed towards CS domain (through G- MSC) (not provided)

An example of this flow is not shown in the present document.

7.2.4.3 CS Networks originated sessions routed either towards IM CN subsystem or towards CS domain (not provided)

An example of this flow is not shown in the present document.

7.2.4.4 Failure in termination procedure

The PSTN subscriber that initiated a session with procedure CS-O had the attempt fail due to an error detected in the Termination procedure or in the S-CSCF-to-S-CSCF procedure. This could be due to, for example, destination busy (error code 486), destination service denied (error code 403), destination currently out of coverage (error code 480), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, the originator could be at many different stages in the session establishment procedure. This is shown in figure 7.2.4.4-1, as optional messages 5-17 that may appear in this error procedure.

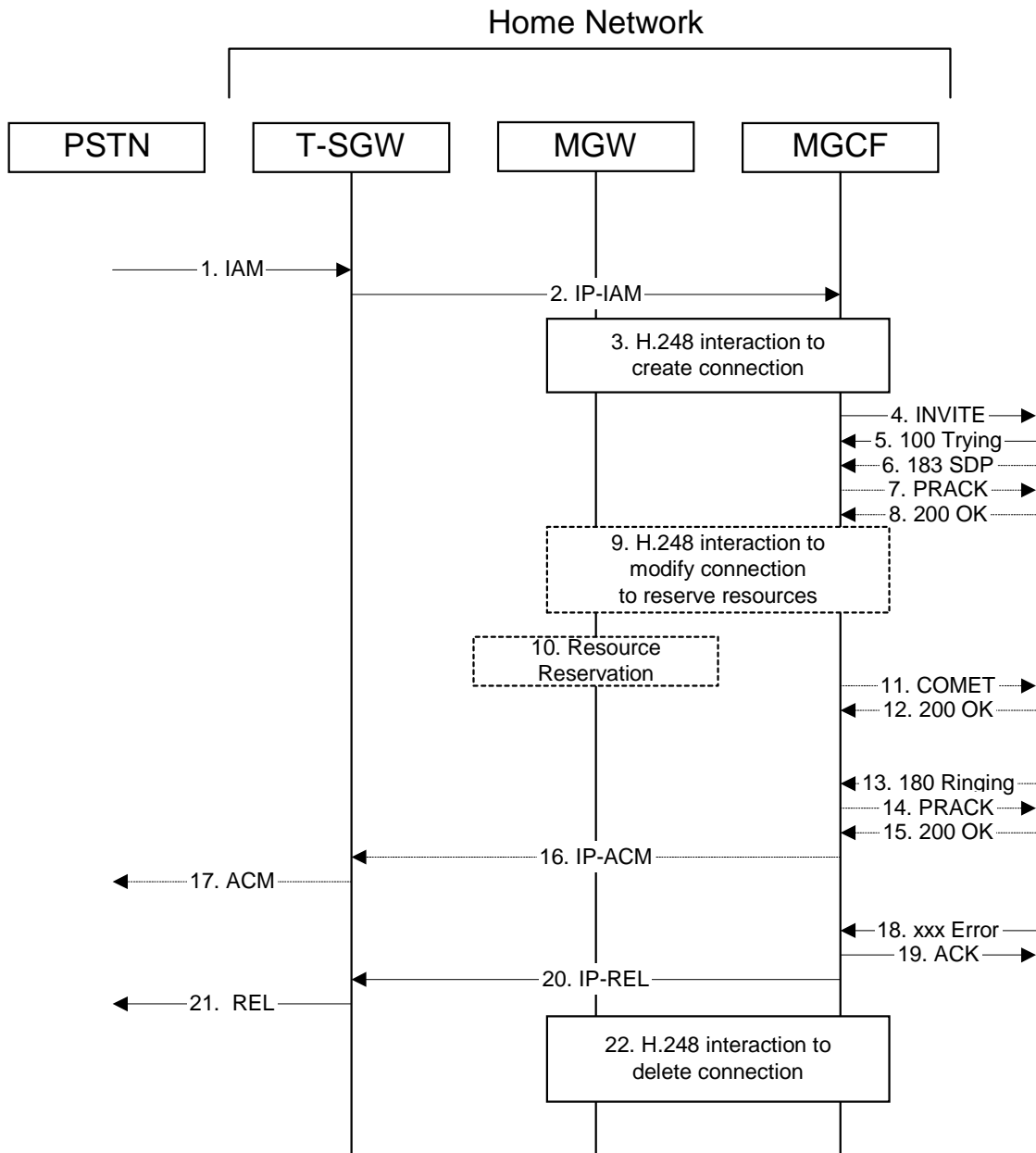


Figure 7.2.4.4-1: Failure in termination procedure

4. INVITE (MGCF to S-S) et seq

The PSTN originator initiated a session, as described in subclause 7.2.4.1.

5-17.100 Trying (S-S to CS-O) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.4.1.

18. xxx Error (S-S to CS-O) – see example in table 7.2.4.4-18

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.2.4.4-18: 486 Busy Here (S-S to CS-O)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP mgcf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

19. ACK (CS-O to S-S) – see example in table 7.2.4.4-19

Upon receive the 486 response from the S-S procedure, S-CSCF sends ACK.

Table 7.2.4.4-19: ACK (CS-O to S-S)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

20. H.248 Interaction

MGCF initiates a H.248 interaction with MGW to delete the connection.

7.2.4.5 Session abandoned, or resource failure

The PSTN subscriber that initiated a session with procedure CS-O either abandoned the attempt, or was unable to obtain the resources necessary for the session. The signalling flow for this error handling is shown in figure 7.2.4.5-1.

If the session is aborted due to failure to obtain resources, it will occur at step #10 in the signalling flow; steps 11-17 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 5-17.

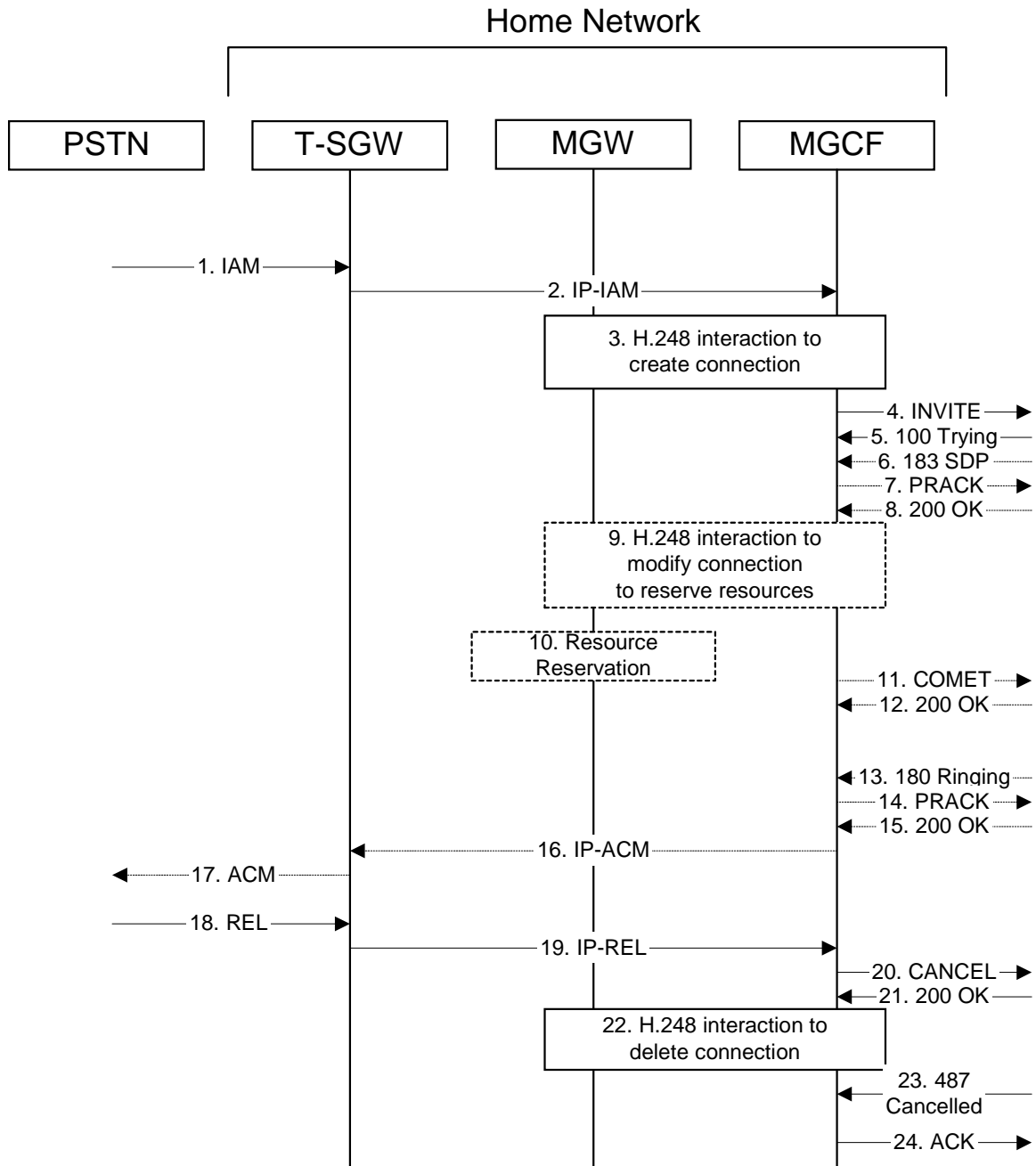


Figure 7.2.4.5-1: Session abandoned or resource failure

4. INVITE (CS-O to S-S) et seq

CS-O initiated a session, as described in subclause 7.2.4.1.

5-15. 183 SDP (S-S to CS-O) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.2.4.1.

20. CANCEL (CS-O to S-S) – see example in table 7.2.4.5-20

The PSTN cancelled the original INVITE request.

Table 7.2.4.5-20: CANCEL (CS-O to S-S)

```
CANCEL sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Content-Length: 0
```

21. 200 OK (S-S to CS-O) – see example in table 7.2.4.5-21

Upon receive the CANCEL request from CS-O, the S-S procedure sends 200 OK.

Table 7.2.4.5-21: 200 OK (S-S to CS-O)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

22. H.248 Interaction

MGCF initiates a H.248 interaction with MGW to delete the connection

23. 487 Cancelled (S-S to CS-O) – see example in table 7.2.4.5-23

The termination procedure processed the CANCEL request, and returned a SIP error response.

Table 7.2.4.5-23: 487 Cancelled (S-S to CS-O)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Contact:
Call-ID:
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

24. ACK (CS-O to S-S) – see example in table 7.2.4.5-24

Upon receive the 487 response from the S-S procedure, MGCF sends ACK.

Table 7.2.4.5-24: ACK (CS-O to S-S)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP mgcf1.home1.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.2.5 Error handling: origination procedures (not provided)

An example of this flow is not shown in the present document.

7.3 S-CSCF (MGCF) to S-CSCF (MGCF) procedures

7.3.1 Introduction

This subclause presents the detailed signalling flows to define the procedures for S-CSCF to S-CSCF.

This subclause contains four signalling flow procedures, showing variations on the signalling path between the S-CSCF (or MGCF) that handles session origination, and the S-CSCF (or MGCF) that handles session termination. This signalling path depends on:

- whether the originator and destination are served by the same network operator;
- agreements between operators for optimum PSTN gateway location.

Between separate operators, there are additional sub-cases covering the optional network configuration hiding – hiding required by both operators, neither operator, or just one operator.

The S-CSCF handling session origination performs an analysis of the destination address, and determines whether it is a PSTN destination, a subscriber of the same network operator or a subscriber of a different operator.

If the analysis of the destination address determined that it belongs to a subscriber of a different operator, the request is forwarded (optionally through an I-CSCF within the originating operator's network) to a well-known entry point in the destination operator's network, the I-CSCF. The I-CSCF queries the HSS for current location information. The I-CSCF then forwards the request to the S-CSCF. This is signalling flow procedure S-S#1.

If the analysis of the destination address determines that it belongs to a subscriber of the same operator, the S-CSCF forwards the request to a local I-CSCF, who queries the HSS for current location information. The I-CSCF then forwards the request to the S-CSCF. This is signalling flow procedure S-S#2.

If the analysis of the destination address determines that it is a PSTN destination, the S-CSCF forwards the request to a local BGCF. Based on further analysis of the destination address, and on agreements between operators for PSTN termination, the BGCF will either select a local MGCF to perform the termination (procedure S-S#3) or will forward the request to a BGCF in another operator's network who will select the MGCF to perform the termination (procedures S-S#4).

7.3.2 S-S#1a

7.3.2.1 (S-S#1a) Different network operators performing origination and termination (MO#1a, MT#1a assumed)

Figure 7.3.2.1-1 shows a S-CSCF handling session origination (S-CSCF#1), which performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. The originating network operator does not desire to keep their configuration hidden, so forwards the request to a well-known entry point in the destination operator's network, I-CSCF. I-CSCF queries the HSS for current location information, and finds the S-CSCF assigned to the subscriber (S-CSCF#2), and forwards the request to S-CSCF#2. The terminating network operator does not desire to keep their configuration hidden, so the I-CSCF does not insert itself into the signalling path for future exchanges.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

MO#1a	Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#1a is therefore a visited network.
MO#1b	Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#1a is therefore a visited network.
MO#2	Mobile origination, located in home service area. The "Originating Network" of S-S#1a is therefore the home network.
CS-O	CS Networks origination. The "Originating Network" of S-S#1a is the home network. The element labelled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- MT#1a** Mobile termination, roaming, without a THIG. The "Terminating Network" of S-S#1a is a visited network.
- MT#1b** Mobile termination, roaming, with a THIG in home network. The "Terminating Network" of S-S#1a is a visited network.
- MT#2** Mobile termination, located in home service area. The "Terminating Network" of S-S#1a is the home network.

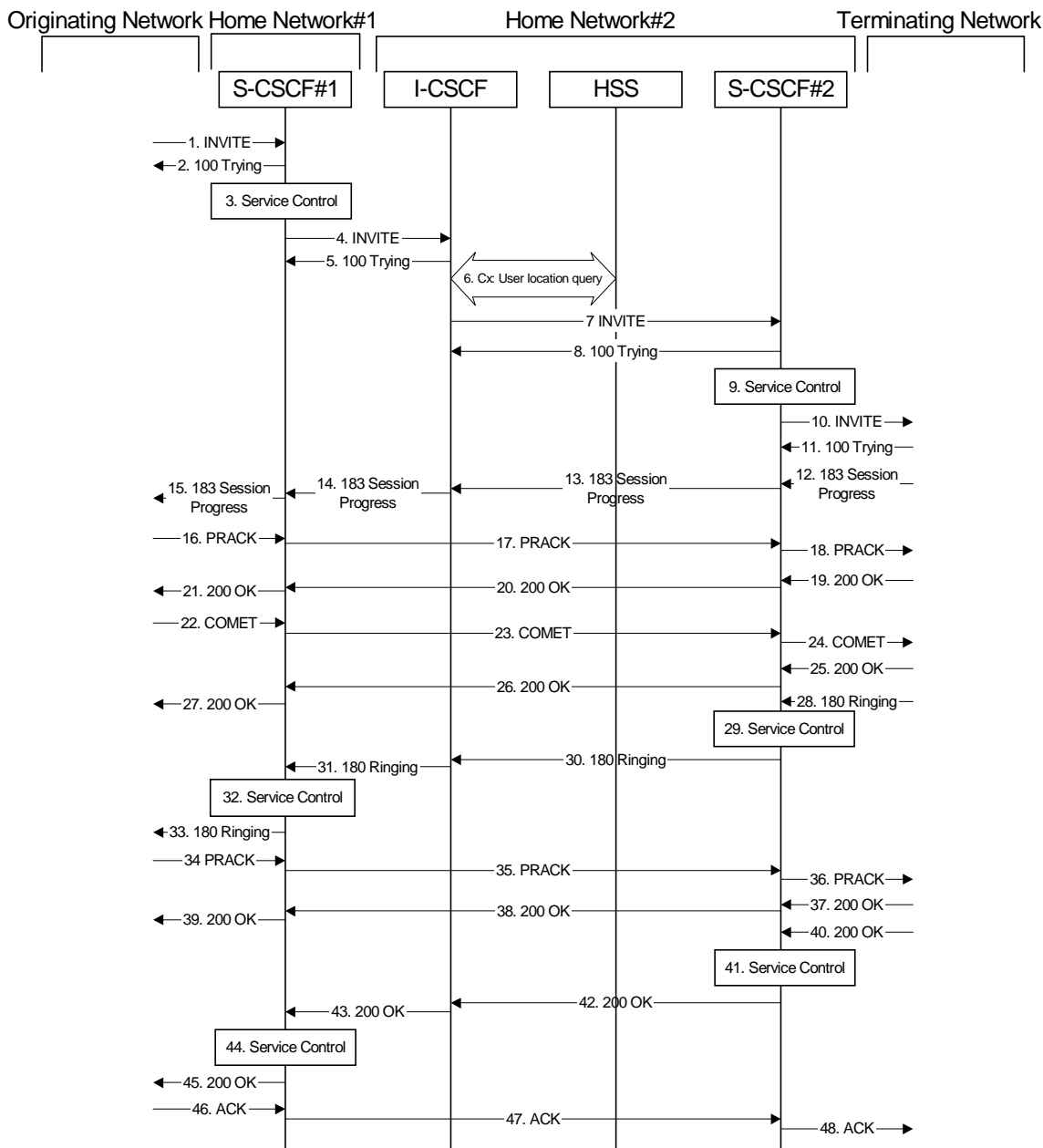


Figure 7.3.2.1-1: S-S#1a

Procedure S-S#1a is as follows:

- 1. INVITE (MO to S-S#1a) – see example in table 7.3.2.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.3.2.1-1: INVITE (MO to S-S#1a)

```

INVITE sip:scscf1.homel.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:+1-212-555-2222@homel.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@homel.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: [5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1a to MO) – see example in table 7.3.2.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.3.2.1-2: 100 Trying (S-S#1a to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 7.3.2.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator does not desire to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request directly to I-CSCF in the destination network.

Table 7.3.2.1-4: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

5. 100 Trying (I-CSCF to S-CSCF) – see example in table 7.3.2.1-5

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 7.3.2.1-5: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 6.3.2-6a provides the parameters in the SIP INVITE request (flow 4), which are sent to the HSS.

Table 7.3.2.1-6a Cx: User registration status query procedure (I-CSCF to HSS)

Message source & destination	Cx: Information element name	Information source in SIP INVITE	Description
I-CSCF to HSS	User Public Identity	Request-URI:	This information element indicates the public user identity

Table 7.3.2.1-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 7) and sent to S-CSCF.

Table 7.3.2.1-6b Cx: User registration status query procedure (HSS to I-CSCF)

Message source & destination	Cx: Information element name	Mapping to SIP header in SIP INVITE	Description
HSS to I-CSCF	S-CSCF name	Request-URI:	This information indicates the serving CSCF's name of that user

7. INVITE (I-CSCF to S-CSCF) – see example in table 7.3.2.1-7

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 7.3.2.1-7: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=

```

NOTE: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

8. 100 Trying (S-CSCF to I-CSCF) – see example in table 7.3.2.1-8

S-CSCF#2 responds to the INVITE request (7) with a 100 Trying provisional response.

Table 7.3.2.1-8: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

9. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

10. INVITE (S-S#1a to MT) – see example in table 7.3.2.1-10

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 7.3.2.1-10: INVITE (S-S#1a to MT)

```
INVITE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
sip:pcscf1.visited1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtptime:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

11. 100 Trying (MT to S-S#1a) – see example in table 7.3.2.1-11 (related to table 7.3.2.1-10)

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request (10), as specified by the termination procedures.

Table 7.3.2.1-11: 100 Trying (MT to S-S#1a)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

12. 183 Session Progress (MT to S-S#1a) – see example in table 7.3.2.1-12 (related to table 7.3.2.1-10)

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response to the INVITE request (10), as per the termination procedure.

Table 7.3.2.1-12: 183 Session Progress (MT to S-S#1a)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

13. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 7.3.2.1-13

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF.

Table 7.3.2.1-13: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

14. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 7.3.2.1-14

I-CSCF forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 7.3.2.1-14: 183 Session Progress (I-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

15. 183 Session Progress (S-S#1a to MO) – see example in table 7.3.2.1-15

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 7.3.2.1-15: 183 Session Progress (S-S#1a to MO)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

16. PRACK (MO to S-S#1a) – see example in table 7.3.2.1-16

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 7.3.2.1-16: PRACK (MO to S-S#1a)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, [5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

17. PRACK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-17

S-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 7.3.2.1-17: PRACK (S-CSCF to S-CSCF)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

18. PRACK (S-S#1a to MT) – see example in table 7.3.2.1-18

S-CSCF#2 forwards the PRACK request to the terminating endpoint, as per the termination procedure.

Table 7.3.2.1-18: PRACK (S-S#1a to MT)

```

PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

19. 200 OK (MT to S-S#1a) – see example in table 7.3.2.1-19 (related to table 7.3.2.1-18)

The terminating endpoint responds to the PRACK request (18) with a 200 OK response.

Table 7.3.2.1-19: 200 OK (MT to S-S#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

20. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-20

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.2.1-20: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

21. 200 OK (S-S#1a to MO) – see example in table 7.3.2.1-21

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.2.1-21: 200 OK (S-S#1a to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

22. COMET (MO to S-S#1a) – see example in table 7.3.2.1-22

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 7.3.2.1-22: COMET (MO to S-S#1a)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net,
      sip:[5555::eee:fff:aaa:bbb]From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B;
      seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET

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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

23. COMET (S-CSCF to S-CSCF) – see example in table 7.3.2.1-23

S-CSCF#1 forwards the COMET request to S-CSCF#2.

Table 7.3.2.1-23: COMET (S-CSCF to S-CSCF)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:

Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

24. COMET (S-S#1a to MT) – see example in table 7.3.2.1-24

S-CSCF#2 forwards the COMET request to the terminating endpoint, as per the termination procedure.

Table 7.3.2.1-24: COMET (S-S#1a to MT)

```

COMET sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:

Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

25. 200 OK (MT to S-S#1a) – see example in table 7.3.2.1-25 (related to table 7.3.2.1-24)

The terminating endpoint responds to the COMET request (24) with a 200 OK response.

Table 7.3.2.1-25: 200 OK (MT to S-S#1a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

26. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-26

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.2.1-26: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

27. 200 OK (S-S#1a to MO) – see example in table 7.3.2.1-27

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.2.1-27: 200 OK (S-S#1a to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

28. 180 Ringing (MT to S-S#1a) – see example in table 7.3.2.1-28 (related to table 7.3.2.1-10)

The terminating endpoint may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to S-CSCF#2.

Table 7.3.2.1-28: 180 Ringing (MT to S-S#1a)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net,sip:764z87.1@scscf2.home2.net,
sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

29. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

30. 180 Ringing (S-CSCF to I-CSCF) – see example in table 7.3.2.1-30

S-CSCF#2 forwards the 180 Ringing response to I-CSCF.

Table 7.3.2.1-30: 180 Ringing (S-CSCF to I-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

31. 180 Ringing (I-CSCF to S-CSCF) – see example in table 7.3.2.1-31

I-CSCF forwards the 180 Ringing response to S-CSCF#1.

Table 7.3.2.1-31: 180 Ringing (I-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

32. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

33. 180 Ringing (S-S#1a to MO) – see example in table 7.3.2.1-33

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 7.3.2.1-33: 180 Ringing (S-S#1a to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

34. PRACK (MO to S-S#1a) – see example in table 7.3.2.1-34

The originator acknowledges the 180 Ringing provisional response (33) with a PRACK request.

Table 7.3.2.1-34: PRACK (MO to S-S#1a)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

35. PRACK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-35

S-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 7.3.2.1-35: PRACK (S-CSCF to S-CSCF)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

36. PRACK (S-S#1a to MT) – see example in table 7.3.2.1-36

S-CSCF#2 forwards the PRACK request to the terminating endpoint.

Table 7.3.2.1-36: PRACK (S-S#1a to MT)

```
PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

37. 200 OK (MT to S-S#1a) – see example in table 7.3.2.1-37 (related to table 7.3.2.1-36)

The terminating endpoint responds to the PRACK request (36) with a 200 OK response.

Table 7.3.2.1-37: 200 OK (MT to S-S#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

38. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-38

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.2.1-38: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

39. 200 OK (S-S#1a to MO) – see example in table 7.3.2.1-39

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.2.1-39: 200 OK (S-S#1a to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

40. 200 OK (MT to S-S#1a) – see example in table 7.3.2.1-40 (related to table 7.3.2.1-10)

The final response to the INVITE request (10), 200 OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session attempt. The response is sent to S-CSCF#2 per the termination procedure.

Table 7.3.2.1-40: 200 OK (MT to S-S#1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.netFrom:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

41. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session completion.

42. 200 OK (S-CSCF to I-CSCF) – see example in table 7.3.2.1-42

The 200 OK response is forwarded to the I-CSCF.

Table 7.3.2.1-42: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

43. 200 OK (I-CSCF to S-CSCF) – see example in table 7.3.2.1-43

The 200 OK response is forwarded to S-CSCF#1.

Table 7.3.2.1-43: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

44. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session completion.

45. 200 OK (S-S#1a to MO) – see example in table 7.3.2.1-45

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 7.3.2.1-45: 200 OK (S-S#1a to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

46. ACK (MO to S-S#1a) – see example in table 7.3.2.1-46

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 7.3.2.1-46: ACK (MO to S-S#1a)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

47. ACK (S-CSCF to S-CSCF) – see example in table 7.3.2.1-47

S-CSCF#1 forwards the ACK request to S-CSCF#2.

Table 7.3.2.1-47: ACK (S-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

48. ACK (S-S#1a to MT) – see example in table 7.3.2.1-48

S-CSCF#2 forwards the ACK request to the terminating endpoint, as per the termination procedure.

Table 7.3.2.1-48: ACK (S-S#1a to MT)

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.3.2.2 Termination failure

The subscriber that originated a session with one of the MO procedures had the attempt fail due to an error detected in the termination procedure. This could be due to, for example, destination busy (error code 486), resource failure (error code 580), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, the S-CSCF-to-S-CSCF procedure could be at many different stages in the session establishment procedure. This is shown in figure 7.3.2.2-1, as optional messages 12-38 that may appear in this error procedure.

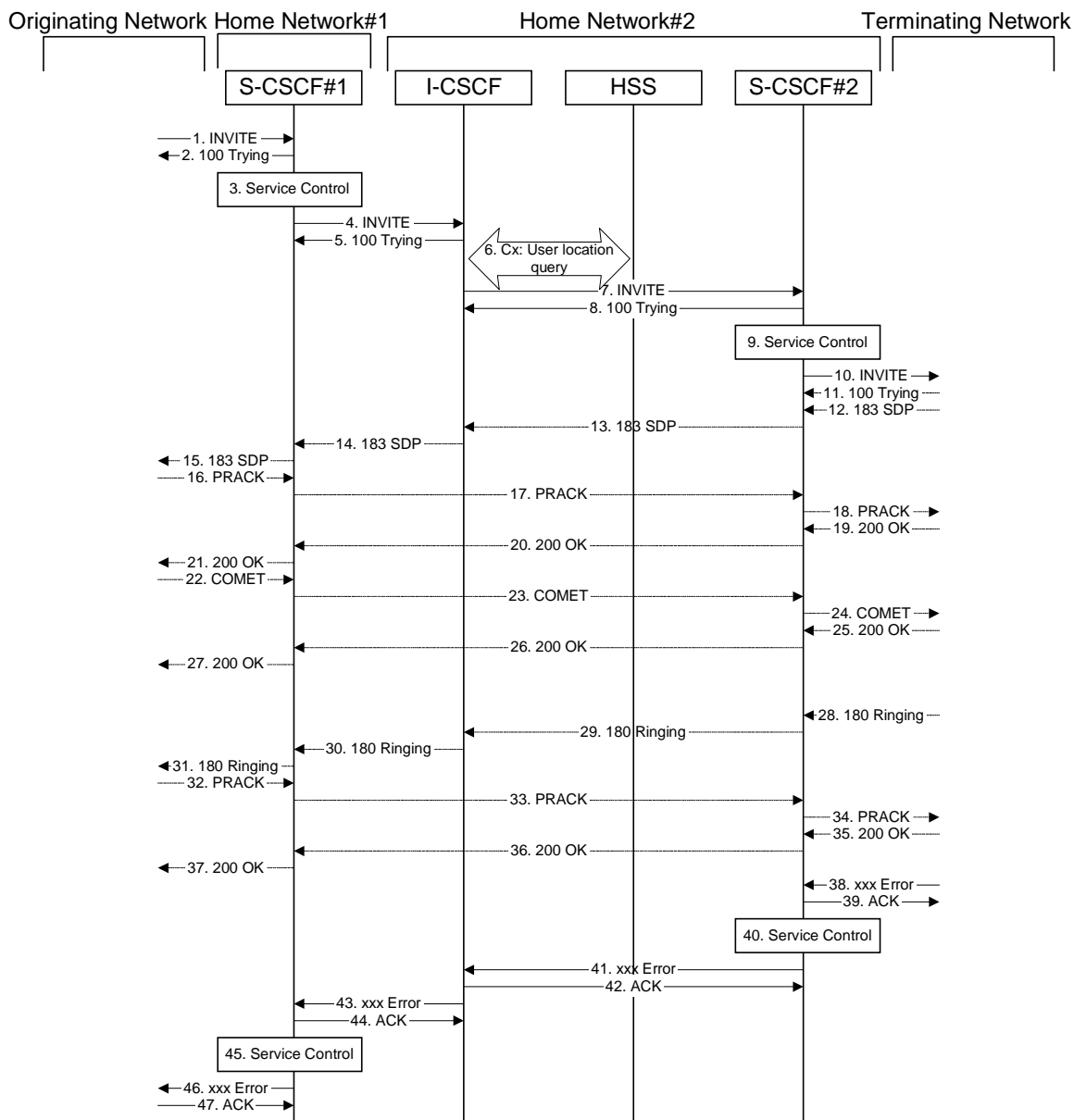


Figure 7.3.2.2-1: Failure in termination procedure

1-10. INVITE (MO to S-CSCF) et seq

A subscriber of the originating network initiated a session, as described in subclause 7.3.2.1.

11-37. 100 Trying (MT to S-CSCF) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.3.2.1.

38. xxx Error (MT to S-CSCF) – see example in table 7.3.2.2-38

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", "580 Precondition Failure", or others. For this example, "486 Busy" is shown.

Table 7.3.2.2-38: 486 Busy Here (MT to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

39. ACK (S-CSCF to MT) – see example in table 7.3.2.2-39

Upon receive the 486 response from the MT procedure, S-CSCF sends ACK.

Table 7.3.2.2-39: ACK (S-CSCF to MT)

```
ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

40. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

41. xxx Error (S-CSCF to I-CSCF) – see example in table 7.3.2.2-41 (related to table 7.3.2.2-38)

The S-CSCF returned a SIP error response to I-CSCF.

NOTE 2: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.3.2.2-41: 486 Busy Here (S-CSCF to I-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0
```

42. ACK (I-CSCF to S-CSCF) – see example in table 7.3.2.2-42

Upon receive the 486 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.2.2-42: ACK (I-CSCF to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```


43. xxx Error (I-CSCF to S-CSCF) – see example in table 7.3.2.2-43 (related to table 7.3.2.2-41)

The I-CSCF returned a SIP error response to S-CSCF.

NOTE 3: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.3.2.2-43: 486 Busy Here (I-CSCF to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0
```

44. ACK (S-CSCF to I-CSCF) – see example in table 7.3.2.2-44

Upon receive the 486 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.2.2-44: ACK (S-CSCF to I-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

45. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

46. xxx Error (S-CSCF to MO) – see example in table 7.3.2.2-46 (related to table 7.3.2.2-43)

The S-CSCF returned a SIP error response to the appropriate MO procedure.

NOTE 4: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.3.2.2-46: 486 Busy Here (S-CSCF to MO)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

47. ACK (MO to S-CSCF) – see example in table 7.3.2.2-47

Upon receiving the 486 response from the S-CSCF, the MO procedure sends ACK.

Table 7.3.2.2-48: ACK (MO to S-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.3.2.3 Origination failure

The subscriber that initiated a session with one of the MO procedures either abandoned the attempt, or was unable to obtain the resources necessary for the session. The signalling flow for this error handling is shown in figure 7.3.2.3-1.

If the session is aborted due to failure to obtain resources, it will occur at step #23 in the signalling flow; steps 23-38 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 13-38.

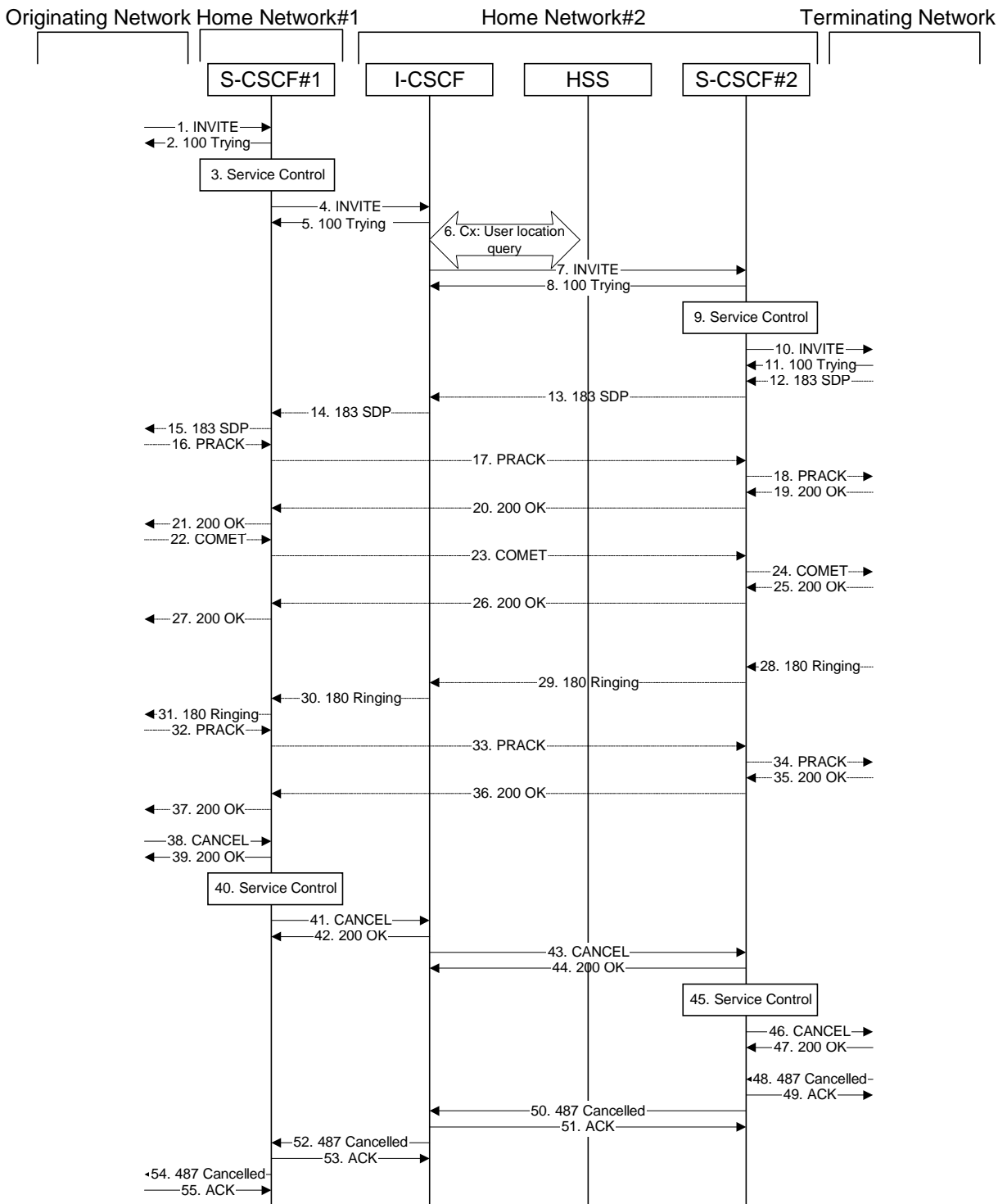


Figure 7.3.2.3-1: Failure in origination procedure

1-11. INVITE (MO to S-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.3.2.1.

12-37. 183 Session Progress (MT to S-CSCF) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.3.2.1.

38. CANCEL (MO to S-CSCF) – see example in table 7.3.2.3-38

The originator, through the MO procedure, cancelled the original INVITE request.

Table 7.3.2.3-38: CANCEL (MO to S-CSCF)

```
CANCEL sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0
```

Editor's Note: Use of Route header in CANCEL is FFS.

39. 200 OK (S-CSCF to S-S) – see example in table 7.3.2.3-39

Upon receive the CANCEL request from the MO procedure, S-CSCF sends 200 OK.

Table 7.3.2.3-39: 200 OK (S-CSCF to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 CANCEL
Content-Length: 0
```

40. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

41. CANCEL (S-CSCF to I-CSCF) – see example in table 7.3.2.3-41 (related to table 7.3.2.3-38)

The S-CSCF forwards the CANCEL request to I-CSCF.

Table 7.3.2.3-41: CANCEL (S-CSCF to I-CSCF)

```
CANCEL sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

42. 200 OK (I-CSCF to S-CSCF) – see example in table 7.3.2.3-42

Upon receiving the CANCEL request from the S-CSCF, P-CSCF sends 200 OK.

Table 7.3.2.3-42: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 CANCEL
Content-Length: 0
```

43. CANCEL (I-CSCF to S-CSCF) – see example in table 7.3.2.3-43 (related to table 7.3.2.3-41)

The I-CSCF forwards the CANCEL request to S-CSCF.

Table 7.3.2.3-43: CANCEL (I-CSCF to S-CSCF)

```
CANCEL sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Editor's Note: Use of Route header in CANCEL is FFS.

44. 200 OK (S-CSCF to I-CSCF) – see example in table 7.3.2.3-44

Upon receiving the CANCEL request from the I-CSCF, S-CSCF sends 200 OK.

Table 7.3.2.3-44: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 CANCEL
Content-Length: 0
```

45. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

46. CANCEL (S-CSCF to MT) – see example in table 7.3.2.3-46 (related to table 7.3.2.3-43)

The P-CSCF forwards the CANCEL request to the appropriate MT procedure.

Table 7.3.2.3-46: CANCEL (S-CSCF to MT)

```
CANCEL sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Editor's Note: Use of Route header in CANCEL is FFS.

47. 200 OK (MT to S-CSCF) – see example in table 7.3.2.3-47

Upon receive the CANCEL request from the S-CSCF, the MT procedure sends 200 OK.

Table 7.3.2.3-47: 200 OK (MT to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
     SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
     SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 CANCEL
Content-Length: 0
```

48. 487 Cancelled (MT to S-CSCF) – see example in table 7.3.2.3-48

The termination procedure detected some error situation, and returned a SIP error response.

Table 7.3.2.3-48: 487 Cancelled (MT to S-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
     SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
     SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
     tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

49. ACK (S-CSCF to MT) – see example in table 7.3.2.3-49

Upon receive the 487 response from the MT procedure, S-CSCF sends ACK.

Table 7.3.2.3-49: ACK (S-CSCF to MT)

```
ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

50. 487 Cancelled (S-CSCF to I-CSCF) – see example in table 7.3.2.3-50 (related to table 7.3.2.3-48)

The S-CSCF returned a SIP error response to I-CSCF.

Table 7.3.2.3-50: 487 Cancelled (S-CSCF to I-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
     SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0
```

51. ACK (I-CSCF to S-CSCF) – see example in table 7.3.2.3-51

Upon receive the 487 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.2.3-51: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

52. 487 Cancelled (I-CSCF to S-CSCF) – see example in table 7.3.2.3-52 (related to table 7.3.2.3-50)

The I-CSCF returned a SIP error response to S-CSCF.

Table 7.3.2.3-52: 487 Cancelled (I-CSCF to S-CSCF)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0

```

53. ACK (S-CSCF to I-CSCF) – see example in table 7.3.2.3-53

Upon receive the 487 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.2.3-53: ACK (S-CSCF to I-CSCF)

```

ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

54. 487 Cancelled (S-CSCF to MO) – see example in table 7.3.2.3-54 (related to table 7.3.2.3-52)

The S-CSCF returned a SIP error response to the appropriate MO procedure.

Table 7.3.2.3-54: 487 Cancelled (S-CSCF to MO)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0

```

55. ACK (MO to S-CSCF) – see example in table 7.3.2.3-55

Upon receive the 487 response from the S-CSCF, the MO procedure sends ACK.

Table 7.3.2.3-55: ACK (MO to S-CSCF)

```

ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

7.3.3 Not applicable

7.3.4 Not applicable

7.3.5 S-S#2

7.3.5.1 (S-S#2) Single network operator performing origination and termination (MO#2, MT#2 assumed)

Figure 7.3.5.1-1 shows a S-CSCF handling session origination, which performs an analysis of the destination address, and determines that it belongs to a subscriber of the same operator. The request is therefore forwarded to a local I-CSCF. The I-CSCF queries the HSS for current location information, and finds the S-CSCF assigned to the subscriber (S-CSCF#2), and forwards the request to S-CSCF#2.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#2 is therefore a visited network.
- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#2 is therefore a visited network.
- MO#2** Mobile origination, located in home service area. The "Originating Network" of S-S#2 is therefore the home network.
- CS-O** CS Networks origination. The "Originating Network" of S-S#2 is the home network. The element labeled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- MT#1a** Mobile termination, roaming, without a THIG. The "Terminating Network" of S-S#2 is a visited network.
- MT#1b** Mobile termination, roaming, with a THIG in home network. The "Terminating Network" of S-S#2 is a visited network.
- MT#2** Mobile termination, located in home service area. The "Terminating Network" of S-S#2 is the home network.

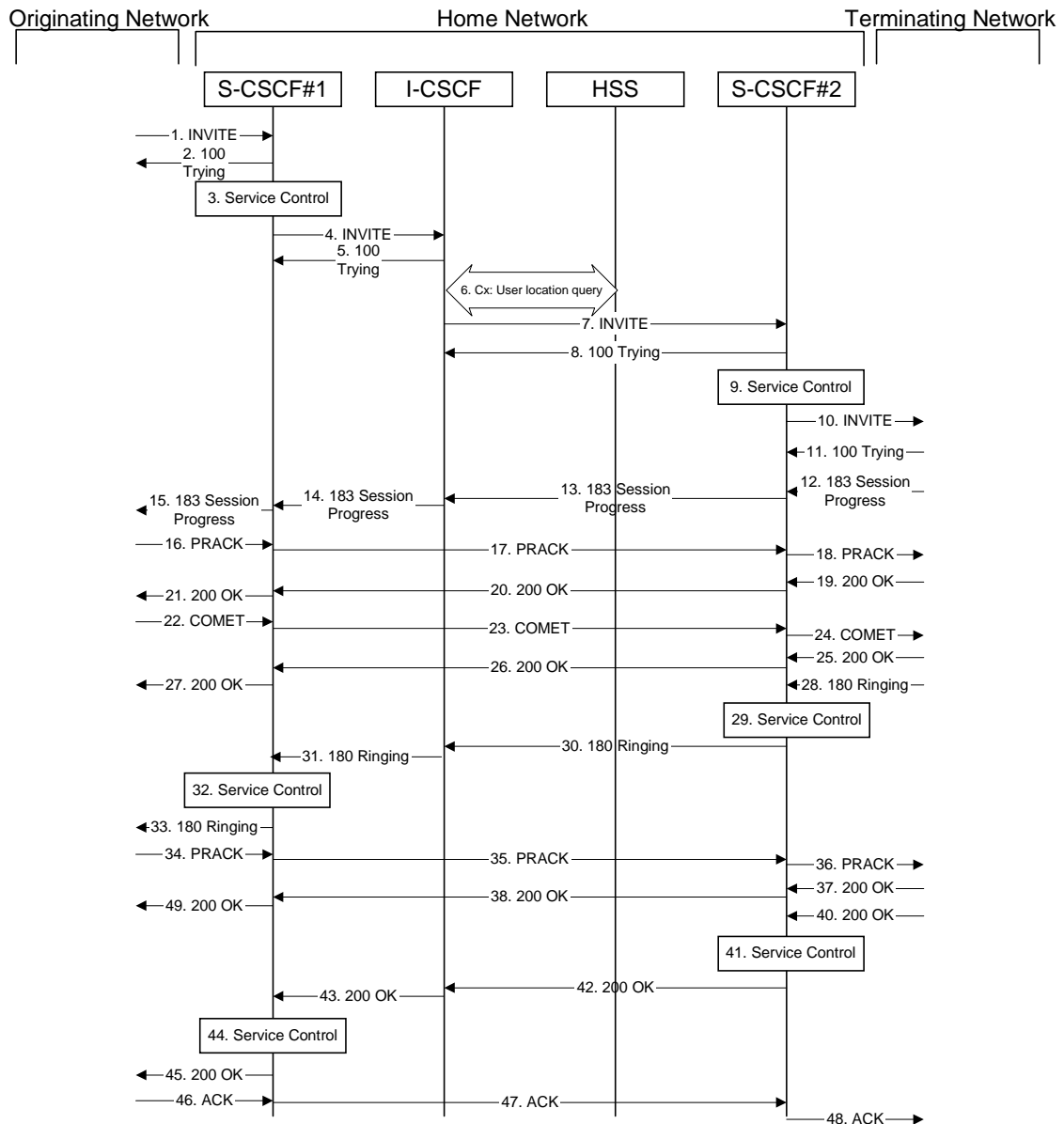


Figure 7.3.5.1-1: S-S#2

Procedure S-S#2 is as follows:

1. INVITE (MO to S-S#2) – see example in table 7.3.5.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.3.5.1-1: INVITE (MO to S-S#2)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#2 to MO) – see example in table 7.3.5.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.3.5.1-2: 100 Trying (S-S#2 to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 7.3.5.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator does not desire to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request directly to I-CSCF in the destination network.

Table 7.3.5.1-4: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
```

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

5. 100 Trying (I-CSCF to S-CSCF) – see example in table 7.3.5.1-5

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 7.3.5.1-5: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2.1-6a provides the parameters in the SIP INVITE request (flow 4), which are sent to the HSS.

Table 7.3.2.1-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE request (flow 7) and sent to S-CSCF.

7. INVITE (I-CSCF to S-CSCF) – see example in table 7.3.5.1-7

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 7.3.5.1-7: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

NOTE: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

8. 100 Trying (S-CSCF to I-CSCF) – see example in table 7.3.5.1-8

S-CSCF#2 responds to the INVITE request (8) with a 100 Trying provisional response.

Table 7.3.5.1-8: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

9. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

10. INVITE (S-S#2 to MT) – see example in table 7.3.5.1-10

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 7.3.5.1-10: INVITE (S-S#2 to MT)

```

INVITE sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmt:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15

```

11. 100 Trying (MT to S-S#2) – see example in table 7.3.5.1-11 (related to table 7.3.5.1-10)

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request (11), as specified by the termination procedures.

Table 7.3.5.1-11: 100 Trying (MT to S-S#2)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

12. 183 Session Progress (MT to S-S#2) – see example in table 7.3.5.1-12 (related to table 7.3.5.1-10)

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response, as per the termination procedure.

Table 7.3.5.1-12: 183 Session Progress (MT to S-S#2)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home1.net, sip:764z87.1@scscf2.home1.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15

```

13. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 7.3.5.1-13

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF.

Table 7.3.5.1-13: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

14. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 7.3.5.1-14

I-CSCF forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 7.3.5.1-14: 183 Session Progress (I-CSCF to S-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

15. 183 Session Progress (S-S#2 to MO) – see example in table 7.3.5.1-15

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 7.3.5.1-15: 183 Session Progress (S-S#2 to MO)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

16. PRACK (MO to S-S#2) – see example in table 7.3.5.1-16

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 7.3.5.1-16: PRACK (MO to S-S#2)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home1.net, sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgklkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

17. PRACK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-17

S-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 7.3.5.1-17: PRACK (S-CSCF to S-CSCF)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

18. PRACK (S-S#2 to MT) – see example in table 7.3.5.1-18

S-CSCF#2 forwards the PRACK request to the terminating endpoint, as per the termination procedure.

Table 7.3.5.1-18: PRACK (S-S#2 to MT)

```

PRACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

19. 200 OK (MT to S-S#2) – see example in table 7.3.5.1-19 (related to table 7.3.5.1-18)

The terminating endpoint responds to the PRACK request (19) with a 200 OK response.

Table 7.3.5.1-19: 200 OK (MT to S-S#2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

20. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-20

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.5.1-20: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

21. 200 OK (S-S#2 to MO) – see example in table 7.3.5.1-21

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.5.1-21: 200 OK (S-S#2 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

22. COMET (MO to S-S#2) – see example in table 7.3.5.1-22

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 7.3.5.1-22: COMET (MO to S-S#2)

```
COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home1.net, sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

23. COMET (S-CSCF to S-CSCF) – see example in table 7.3.5.1-23

S-CSCF#1 forwards the COMET request to S-CSCF#2.

Table 7.3.5.1-23: COMET (S-CSCF to S-CSCF)

```
COMET sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

24. COMET (S-S#2 to MT) – see example in table 7.3.5.1-24

S-CSCF#2 forwards the COMET request to the terminating endpoint, as per the termination procedure.

Table 7.3.5.1-24: COMET (S-S#2 to MT)

```

COMET sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

25. 200 OK (MT to S-S#2) – see example in table 7.3.5.1-25 (related to table 7.3.5.1-24)

The terminating endpoint responds to the COMET request (25) with a 200 OK response.

Table 7.3.5.1-25: 200 OK (MT to S-S#2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

26. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-26

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.5.1-26: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

27. 200 OK (S-S#2 to MO) – see example in table 7.3.5.1-27

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.5.1-27: 200 OK (S-S#2 to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]

```

```

From:
To:
Call-ID:
CSeq:
Content-Length:

```

28. 180 Ringing (MT to S-S#2) – see example in table 7.3.5.1-28 (related to table 7.3.5.1-10)

The terminating endpoint may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to S-CSCF#2.

Table 7.3.5.1-28: 180 Ringing (MT to S-S#2)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home1.net, sip:764z87.1@scscf2.home1.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0

```

29. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

30. 180 Ringing (S-CSCF to I-CSCF) – see example in table 7.3.5.1-30

S-CSCF#2 forwards the 180 Ringing response to I-CSCF.

Table 7.3.5.1-30: 180 Ringing (S-CSCF to I-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

31. 180 Ringing (I-CSCF to S-CSCF) – see example in table 7.3.5.1-31

I-CSCF forwards the 180 Ringing response to S-CSCF#1.

Table 7.3.5.1-31: 180 Ringing (I-CSCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

32. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

33. 180 Ringing (S-S#2 to MO) – see example in table 7.3.5.1-33

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 7.3.5.1-33: 180 Ringing (S-S#2 to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

34. PRACK (MO to S-S#2) – see example in table 7.3.5.1-34

The originator acknowledges the 180 Ringing provisional response (34) with a PRACK request.

Table 7.3.5.1-34: PRACK (MO to S-S#2)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home1.net, sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

35. PRACK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-35

S-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 7.3.5.1-35: PRACK (S-CSCF to S-CSCF)

```
PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

36. PRACK (S-S#2 to MT) – see example in table 7.3.5.1-36

S-CSCF#2 forwards the PRACK request to the terminating endpoint.

Table 7.3.5.1-36: PRACK (S-S#2 to MT)

```
PRACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
```

```
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

37. 200 OK (MT to S-S#2) – see example in table 7.3.5.1-37 (related to table 7.3.5.1-36)

The terminating endpoint responds to the PRACK request (37) with a 200 OK response.

Table 7.3.5.1-37: 200 OK (MT to S-S#2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

38. 200 OK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-38

S-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 7.3.5.1-38: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

39. 200 OK (S-S#2 to MO) – see example in table 7.3.5.1-39

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.5.1-39: 200 OK (S-S#2 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

40. 200 OK (MT to S-S#2) – see example in table 7.3.5.1-40 (related to table 7.3.5.1-10)

The final response, 200 OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session attempt. The response is sent to S-CSCF#2 per the termination procedure.

Table 7.3.5.1-40: 200 OK (MT to S-S#2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home1.net, sip:764z87.1@scscf2.home1.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
```

```

Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

41. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session completion.

42. 200 OK (S-CSCF to I-CSCF) – see example in table 7.3.5.1-42

The 200 OK response is forwarded to the I-CSCF.

Table 7.3.5.1-42: 200 OK (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

43. 200 OK (I-CSCF to S-CSCF) – see example in table 7.3.5.1-43

The 200 OK response is forwarded to S-CSCF#1.

Table 7.3.5.1-43: 200 OK (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

```

```
v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

44. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session completion.

45. 200 OK (S-S#2 to MO) – see example in table 7.3.5.1-45

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 7.3.5.1-45: 200 OK (S-S#2 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

46. ACK (MO to S-S#2) – see example in table 7.3.5.1-46

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 7.3.5.1-46: ACK (MO to S-S#2)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home1.net, sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0
```

47. ACK (S-CSCF to S-CSCF) – see example in table 7.3.5.1-47

S-CSCF#1 forwards the ACK request to S-CSCF#2.

Table 7.3.5.1-47: ACK (S-CSCF to S-CSCF)


```
ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

48. ACK (S-S#2 to MT) – see example in table 7.3.5.1-48

S-CSCF#2 forwards the ACK request to the terminating endpoint, as per the termination procedure.

Table 7.3.5.1-48: ACK (S-S#2 to MT)

```
ACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

7.3.5.2 (S-S#2) Single network operator performing origination and termination, terminating UE is busy, and not able or not willing to answer the call (MO#2, MT#2 assumed)

Figure 7.3.5.2-1 shows the subscriber that originated a session with one of the MO procedures had the attempt fail due to an error detected in the termination procedure. In this flow, 486 error response is shown as the example.

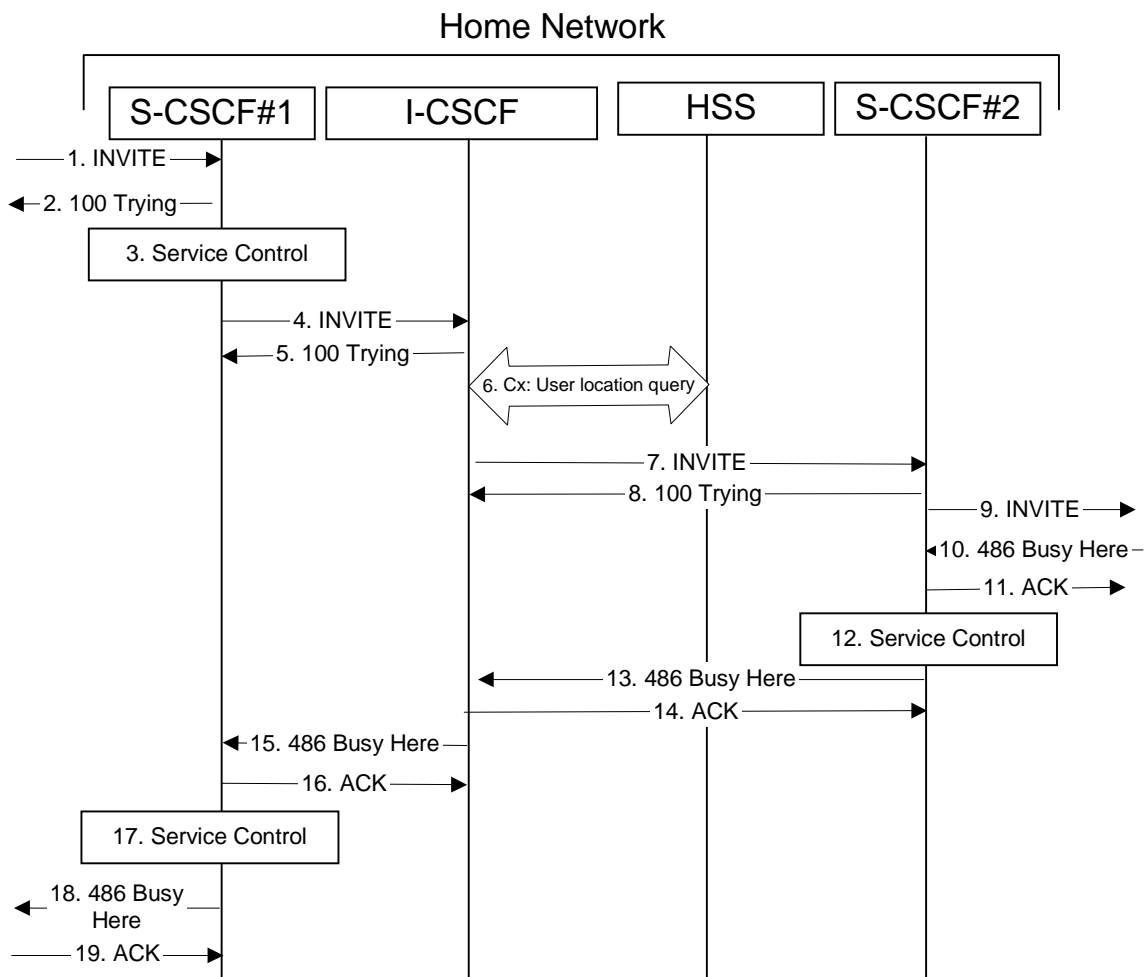


Figure 7.3.5.2: (S-S#2) Single network operator performing origination and termination, terminating UE is busy, and not able or not willing to answer the call (MO#2, MT#2 assumed)

1-9. The same as described in flow 1-8 in subclause 7.3.5

10. **486 Busy Here (MT to S-CSCF)** – see example in table 7.3.5.2-10

The termination procedure detected some error situation, and returned a SIP 486 Busy Here response.

NOTE: The error response may be other error responses like "403 Service Denied", "480 Temporarily Unavailable", "580 Precondition Failure", or others. For this example, "486 Busy" is shown.

Table 7.3.5.2-10: 486 Busy Here (MT to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

11. **ACK (S-CSCF to MT)** – see example in table 7.3.5.2-11

Upon receive the 486 response from the MT procedure, S-CSCF sends ACK.

Table 7.3.5.2-11: ACK (S-CSCF to MT)

```

ACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP sip:scscf2.home1.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

12. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

13. 486 Busy Here (S-CSCF to I-CSCF) – see example in table 7.3.5.2-13

The S-CSCF returned a SIP error response to I-CSCF.

Table 7.3.5.2-13: 486 Busy Here (S-CSCF to I-CSCF)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0

```

14. ACK (I-CSCF to S-CSCF) – see example in table 7.3.5.2-14

Upon receive the 486 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.5.2-14: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

15. 486 Busy Here (I-CSCF to S-CSCF) – see example in table 7.3.5.2-15 (related to table 7.3.5.2-42)

The I-CSCF returned a SIP error response to S-CSCF.

Table 7.3.5.2-15: 486 Busy Here (I-CSCF to S-CSCF)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Retry-After:3600
Content-Length: 0

```

16. ACK (S-CSCF to I-CSCF) – see example in table 7.3.5.2-16

Upon receive the 486 response from the S-CSCF procedure, I-CSCF sends ACK.

Table 7.3.5.2-16: ACK (S-CSCF to I-CSCF)

```

ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

17. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

18. 486 Busy Here (S-CSCF to MO) – see example in table 7.3.5.2-18

The S-CSCF returned a SIP error response to the appropriate MO procedure.

Table 7.3.5.2-18: 486 Busy Here (S-CSCF to MO)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0

```

19. ACK (MO to S-CSCF) – see example in table 7.3.5.2-19

Upon receiving the 486 response from the S-CSCF, the MO procedure sends ACK.

Table 7.3.5.2-19: ACK (MO to S-CSCF)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

7.3.5.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

7.3.6 S-S#3**7.3.6.1 (S-S#3) PSTN Termination performed by home network of originator (MO#2 assumed)**

Figure 7.3.6.1-1 shows a S-CSCF handling session origination, which performs an analysis of the destination address, and determines that it will result in a PSTN termination. The request is therefore forwarded to a local BGCF. The BGCF performs further analysis of the destination address, combined with information of agreements between operators for optimum Gateway selection, and decides to do the PSTN termination locally. The BGCF therefore allocates a MGCF within the home network, and sends the request to it.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#3 is therefore a visited network.

- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#3 is therefore a visited network.
- MO#2** Mobile origination, located in home service area. The "Originating Network" of S-S#3 is therefore the home network.
- CS-O** CS Networks origination. The "Originating Network" of S-S#3 is the home network. The element labelled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- CS-T** CS Networks termination.

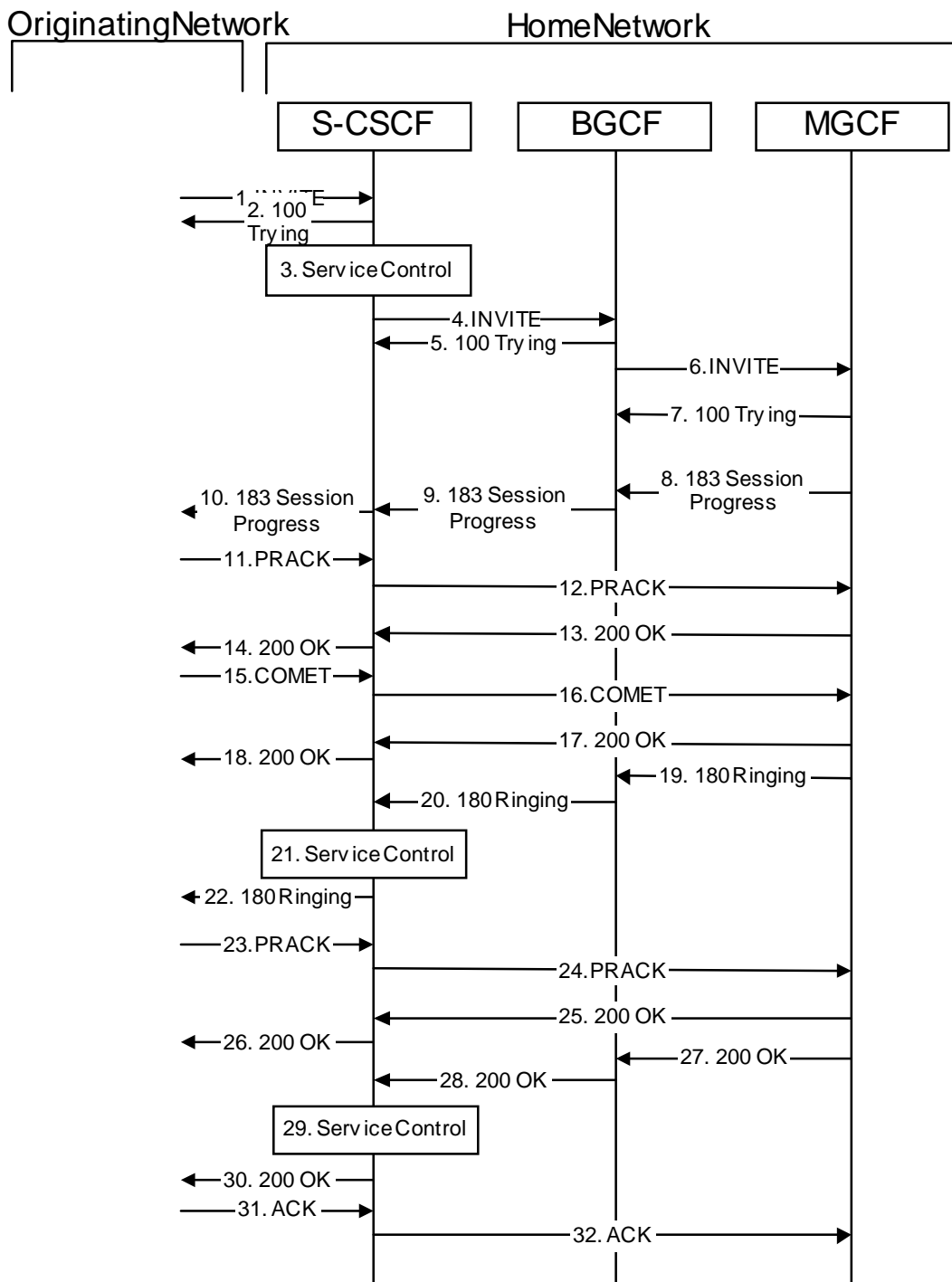


Figure 7.3.6.1-1: S-S#3

Procedure S-S#3 is as follows:

1. **INVITE (MO to S-S#3) – see example in table 7.3.6.1-1**

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.3.6.1-1: INVITE (MO to S-S#3)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. **100 Trying (S-S#3 to MO) – see example in table 7.3.6.1-2**

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.3.6.1-2: 100 Trying (S-S#3 to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. **Service Control**

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to BGCF) – see example in table 7.3.6.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the destination is on the PSTN. S-CSCF forwards the INVITE request to the BGCF in the local network.

Table 7.3.6.1-4: INVITE (S-CSCF to BGCF)

```

INVITE sip:bgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Route: In the case of a TEL-URL, it has to be translated to a globally routable SIP-URL before sending the INVITE request. For this address translation the S-CSCF may use the services of an ENUM-DNS based database structure, or any other suitable translation database.

Editor's Note: It remains to be clarified if the use of the word "may" in the above sentence, needs to be changed to "shall". 23.228v170 states that an S-CSCF shall support an ENUM DNS translation mechanism, so the above text needs to be aligned with Stage 2.

5. 100 Trying (BGCF to S-CSCF) – see example in table 7.3.6.1-5

BGCF sends a 100 Trying provisional response to S-CSCF.

Table 7.3.6.1-5: 100 Trying (BGCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. INVITE (BGCF to MGCF) – see example in table 7.3.6.1-6

BGCF analyzes the destination address, and allocates a MGCF to handle the termination. BGCF forwards the INVITE request to the MGCF.

Table 7.3.6.1-6: INVITE (BGCF to MGCF)

```

INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route:
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=

```

NOTE: The BGCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

7. 100 Trying (MGCF to BGCF) – see example in table 7.3.6.1-7

MGCF responds to the INVITE request (6) with a 100 Trying provisional response.

Table 7.3.6.1-7: 100 Trying (MGCF to BGCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. 183 Session Progress (MGCF to BGCF) – see example in table 7.3.6.1-8

The MGCF returns the media stream capabilities of the destination along the signalling path in a 183 Session Progress provisional response.

Table 7.3.6.1-8: 183 Session Progress (MGCF to BGCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:mgcf1.home1.net
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15

```

9. 183 Session Progress (BGCF to S-CSCF) – see example in table 7.3.6.1-9

BGCF forwards the 183 Session Progress provisional response to S-CSCF.

Table 7.3.6.1-9: 183 Session Progress (BGCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

10. 183 Session Progress (S-S#3 to MO) – see example in table 7.3.6.1-10

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 7.3.6.1-10: 183 Session Progress (S-S#3 to MO)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

11. PRACK (MO to S-S#3) – see example in table 7.3.6.1-11

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 7.3.6.1-11: PRACK (MO to S-S#3)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

12. PRACK (S-CSCF to MGCF) – see example in table 7.3.6.1-12

S-CSCF forwards the PRACK request to MGCF.

Table 7.3.6.1-12: PRACK (S-CSCF to MGCF)

```

PRACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
m=

```

13. 200 OK (MGCF to S-CSCF) – see example in table 7.3.6.1-13

The MGCF responds to the PRACK request (12) with a 200 OK response.

Table 7.3.6.1-13: 200 OK (MGCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

14. 200 OK (S-S#3 to MO) – see example in table 7.3.6.1-14

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.6.1-14: 200 OK (S-S#3 to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

15. COMET (MO to S-S#3) – see example in table 7.3.6.1-15

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 7.3.6.1-15: COMET (MO to S-S#3)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

16. COMET (S-CSCF to MGCF) – see example in table 7.3.6.1-16

S-CSCF forwards the COMET request to MGCF.

Table 7.3.6.1-16: COMET (S-CSCF to MGCF)

```

COMET sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

17. 200 OK (MGCF to S-CSCF) – see example in table 7.3.6.1-17

The MGCF responds to the COMET request (16) with a 200 OK response.

Table 7.3.6.1-17: 200 OK (MGCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

18. 200 OK (S-S#3 to MO) – see example in table 7.3.6.1-18

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.6.1-18: 200 OK (S-S#3 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

19. 180 Ringing (MGCF to BGCF) – see example in table 7.3.6.1-19

The MGCF may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to BGCF.

Table 7.3.6.1-19: 180 Ringing (MGCF to BGCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf1.home1.net
RSeq: 9022
Content-Length: 0
```

20. 180 Ringing (BGCF to S-CSCF) – see example in table 7.3.6.1-20

BGCF forwards the 180 Ringing response to S-CSCF.

Table 7.3.6.1-20: 180 Ringing (BGCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

21. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

22. 180 Ringing (S-S#3 to MO) – see example in table 7.3.6.1-22

S-CSCF forwards the 180 Ringing response to the originator, per the origination procedure.

Table 7.3.6.1-22: 180 Ringing (S-S#3 to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

23. PRACK (MO to S-S#3) – see example in table 7.3.6.1-23

The originator acknowledges the 180 Ringing provisional response (22) with a PRACK request.

Table 7.3.6.1-23: PRACK (MO to S-S#3)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

24. PRACK (S-CSCF to MGCF) – see example in table 7.3.6.1-24

S-CSCF forwards the PRACK request to MGCF.

Table 7.3.6.1-24: PRACK (S-CSCF to MGCF)

```
PRACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

25. 200 OK (MGCF to S-CSCF) – see example in table 7.3.6.1-25

The MGCF responds to the PRACK request (24) with a 200 OK response.

Table 7.3.6.1-25: 200 OK (MGCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

26. 200 OK (S-S#3 to MO) – see example in table 7.3.6.1-26

S-CSCF forwards the 200 OK response to the originating endpoint.

Table 7.3.6.1-26: 200 OK (S-S#3 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

27. 200 OK (MGCF to BGCF) – see example in table 7.3.6.1-27

The final response, 200 OK, is sent by the MGCF over the signalling path when the subscriber has accepted the incoming session attempt.

Table 7.3.6.1-27: 200 OK (MGCF to BGCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf1.home1.net
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

28. 200 OK (BGCF to S-CSCF) – see example in table 7.3.6.1-28

The 200 OK response is forwarded to the S-CSCF.

Table 7.3.6.1-28: 200 OK (BGCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

29. Service Control

S-CSCF performs whatever service control logic is appropriate for this session completion.

30. 200 OK (S-S#3 to MO) – see example in table 7.3.6.1-30

The 200 OK is returned to the originating endpoint, by the origination procedure.

Table 7.3.6.1-30: 200 OK (S-S#3 to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

31. ACK (MO to S-S#3) – see example in table 7.3.6.1-31

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 7.3.6.1-31: ACK (MO to S-S#3)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

32. ACK (S-CSCF to MGCF) – see example in table 7.3.6.1-32

S-CSCF#1 forwards the ACK request to MGCF.

Table 7.3.6.1-32: ACK (S-CSCF to MGCF)

```

ACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.3.7 S-S#4**7.3.7.1 (S-S#4) PSTN Termination performed by different operator than origination (MO#2 assumed)**

Figure 7.3.7.1-1 shows a S-CSCF handling session origination, which performs an analysis of the destination address, and determines that it will result in a PSTN termination. The request is therefore forwarded to a local BGCF (BGCF#1). BGCF#1 performs further analysis of the destination address, combined with information of agreements between operators for optimum Gateway selection, and decides to do the PSTN termination in a different operator's network. BGCF#1 therefore forwards the request to a BGCF in the terminating operator's network, BGCF#2. BGCF#2 allocates a MGCF within the its network, and sends the request to it.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#4 is therefore a visited network.
- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#4 is therefore a visited network.
- MO#2** Mobile origination, located in home service area. The "Originating Network" of S-S#4 is therefore the home network.
- CS-O** CS Networks origination. The "Originating Network" of S-S#4 is the home network. The element labeled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- CS-T** CS Networks termination.

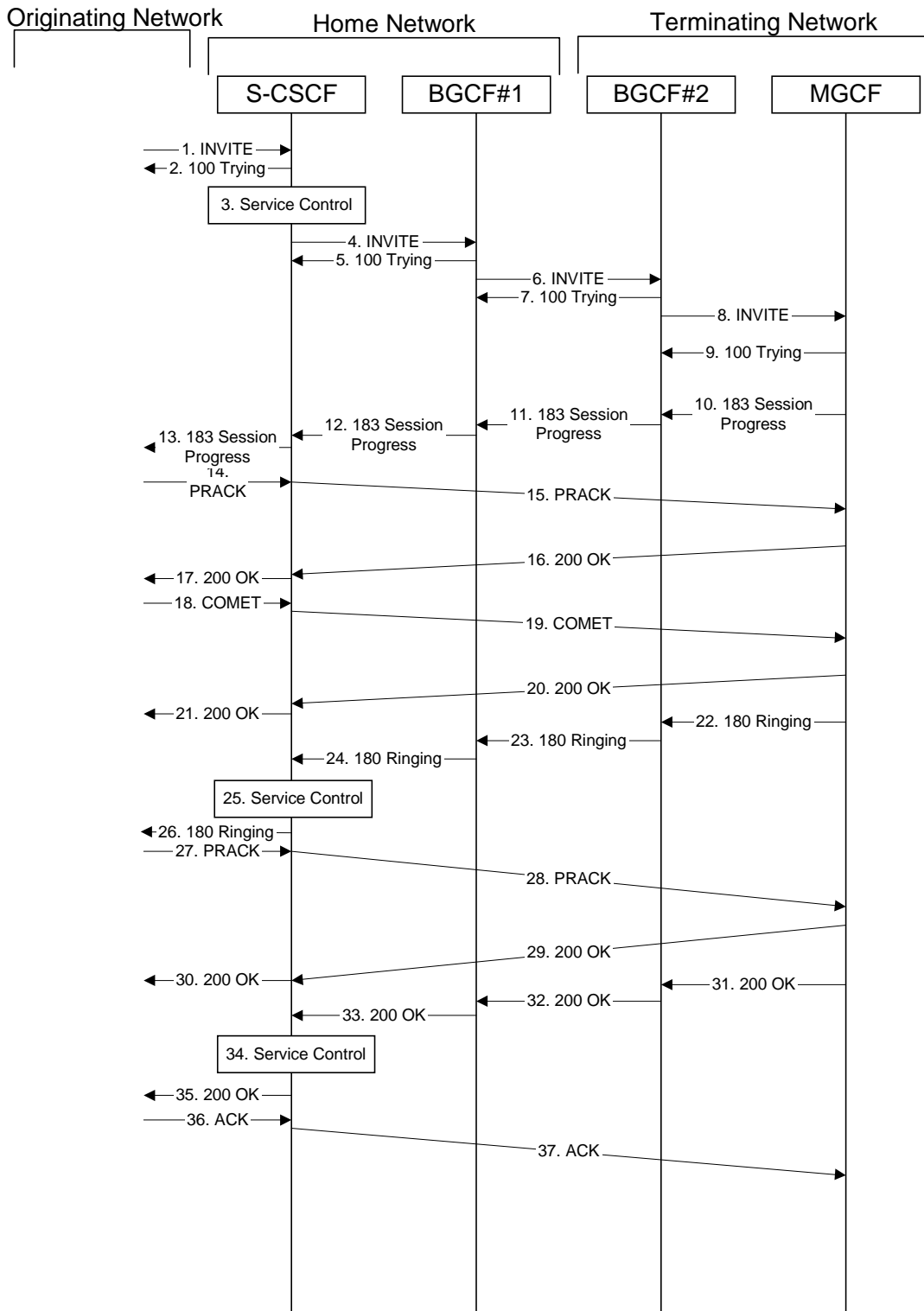


Figure 7.3.7.1-1: S-S#4

Procedure S-S#4 is as follows:

1. INVITE (MO to S-S#4) – see example in table 7.3.7.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.3.7.1-1: INVITE (MO to S-S#4)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#4 to MO) – see example in table 7.3.7.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.3.7.1-2: 100 Trying (S-S#4 to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to BGCF) – see example in table 7.3.7.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the destination is on the PSTN. S-CSCF#1 forwards the INVITE request to the BGCF in the local network.

Table 7.3.7.1-4: INVITE (S-CSCF to BGCF)

```

INVITE sip:bgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

5. 100 Trying (BGCF to S-CSCF) – see example in table 7.3.7.1-5

BGCF#1 sends a 100 Trying provisional response to S-CSCF#1.

Table 7.3.7.1-5: 100 Trying (BGCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. INVITE (BGCF to BGCF) – see example in table 7.3.7.1-6

BGCF#1 analyses the destination address, and the inter-operator agreements for optimal PSTN termination, and selects the network operator that can best terminate this session. BGCF#1 forwards the INVITE request to the BGCF (BGCF#2) in the network that will handle the session termination.

Table 7.3.7.1-6: INVITE (BGCF to BGCF)

```

INVITE sip:bgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route:
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

7. 100 Trying (BGCF to BGCF) – see example in table 7.3.7.1-7

BGCF#2 responds to the INVITE request (6) with a 100 Trying provisional response.

Table 7.3.7.1-7: 100 Trying (BGCF to BGCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. INVITE (BGCF to MGCF) – see example in table 7.3.7.1-8

BGCF#2 allocates a Media Gateway Controller, and forwards the INVITE request to that MGCF.

Table 7.3.7.1-8: INVITE (BGCF to MGCF)

```

INVITE sip:mgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP bgcf2.home2.net;branch=456u71.1, SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

9. 100 Trying (MGCF to BGCF) – see example in table 7.3.7.1-9

MGCF sends a 100 Trying provisional response.

Table 7.3.7.1-9: 100 Trying (MGCF to BGCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP bgcf2.home2.net;branch=456u71.1, SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

10. 183 Session Progress (MGCF to BGCF) – see example in table 7.3.7.1-10

MGCF returns the media stream capabilities of the destination in a 183 Session Progress provisional response.

Table 7.3.7.1-10: 183 Session Progress (MGCF to BGCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP bgcf2.home2.net;branch=456u71.1, SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:mgcf2.home2.net
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15

```

11. 183 Session Progress (BGCF to BGCF) – see example in table 7.3.7.1-11

BGCF#2 forwards the 183 Session Progress provisional response to BGCF#1.

Table 7.3.7.1-11: 183 Session Progress (BGCF to BGCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

12. 183 Session Progress (BGCF to S-CSCF) – see example in table 7.3.7.1-12

BGCF#1 forwards the 183 Session Progress provisional response to S-CSCF.

Table 7.3.7.1-12: 183 Session Progress (BGCF to S-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=
```

13. 183 Session Progress (S-S#4 to MO) – see example in table 7.3.7.1-13

S-CSCF#1 forwards the 183 Session Progress response to the originator, as per the originating procedure.

Table 7.3.7.1-13: 183 Session Progress (S-S#4 to MO)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=
```


14. PRACK (MO to S-S#4) – see example in table 7.3.7.1-14

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF by the origination procedures.

Table 7.3.7.1-14: PRACK (MO to S-S#4)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:6546q2.1@bgcf1.home1.net, sip:456u71.1@bgcf2.home2.net, sip:mgcf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

15. PRACK (S-CSCF to MGCF) – see example in table 7.3.7.1-15

S-CSCF forwards the PRACK request to the MGCF.

Table 7.3.7.1-15: PRACK (BGCF to MGCF)

```

PRACK sip:mgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

16. 200 OK (MGCF to S-CSCF) – see example in table 7.3.7.1-16

The MGCF responds to the PRACK request (15) with a 200 OK response.

Table 7.3.7.1-16: 200 OK (MGCF to BGCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

17. 200 OK (S-S#4 to MO) – see example in table 7.3.7.1-17

S-CSCF forwards the 200 OK response to the originating endpoint.

Table 7.3.7.1-17: 200 OK (S-S#4 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

18. COMET (MO to S-S#4) – see example in table 7.3.7.1-18

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 7.3.7.1-18: COMET (MO to S-S#4)

```
COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

19. COMET (BGCF to MGCF) – see example in table 7.3.7.1-19

S-CSCF forwards the COMET request to the MGCF.

Table 7.3.7.1-19: COMET (BGCF to MGCF)

```

COMET sip:mgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

20. 200 OK (MGCF to BGCF) – see example in table 7.3.7.1-20

The MGCF responds to the COMET request (19) with a 200 OK response.

Table 7.3.7.1-20: 200 OK (MGCF to BGCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

21. 200 OK (S-S#4 to MO) – see example in table 7.3.7.1-21

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 7.3.7.1-21: 200 OK (S-S#4 to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

22. 180 Ringing (MGCF to BGCF) – see example in table 7.3.7.1-22

The MGCF may optionally send a 180 Ringing provisional response indicating alerting is in progress.

Table 7.3.7.1-22: 180 Ringing (MGCF to BGCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP bgcf2.home2.net;branch=456u71.1, SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf2.home2.net
RSeq: 9022
Content-Length: 0

```

23. 180 Ringing (BGCF to BGCF) – see example in table 7.3.7.1-23

BGCF#2 forwards the 180 Ringing response to BGCF#1.

Table 7.3.7.1-23: 180 Ringing (BGCF to BGCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

24. 180 Ringing (BGCF to S-CSCF) – see example in table 7.3.7.1-24

BGCF#1 forwards the 180 Ringing response to S-CSCF.

Table 7.3.7.1-24: 180 Ringing (BGCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

25. Service Control

S-CSCF performs whatever service control logic is appropriate for this session completion.

26. 180 Ringing (S-S#4 to MO) – see example in table 7.3.7.1-26

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 7.3.7.1-25: 180 Ringing (S-S#4 to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

27. PRACK (MO to S-S#4) – see example in table 7.3.7.1-27

The originator acknowledges the 180 Ringing provisional response (33) with a PRACK request.

Table 7.3.7.1-27: PRACK (MO to S-S#4)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

28. PRACK (BGCF to MGCF) – see example in table 7.3.7.1-28

S-CSCF forwards the PRACK request to the MGCF.

Table 7.3.7.1-28: PRACK (S-CSCF to MGCF)

```
PRACK sip:mgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

29. 200 OK (MGCF to S-CSCF) – see example in table 7.3.7.1-29

The MGCF responds to the PRACK request (28) with a 200 OK response.

Table 7.3.7.1-28: 200 OK (MGCF to S-SCSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home2.net, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

30. 200 OK (S-S#4 to MO) – see example in table 7.3.7.1-30

S-CSCF forwards the 200 OK to the originating endpoint.

Table 7.3.7.1-30: 200 OK (S-S#4 to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

31. 200 OK (MGCF to BGCF) – see example in table 7.3.7.1-31

The final response, 200 OK, is sent by the MGCF when the subscriber has accepted the incoming session attempt.

Table 7.3.7.1-31: 200 OK (MGCF to BGCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf2.home2.net
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

32. 200 OK (BGCF to BGCF) – see example in table 7.3.7.1-32

BGCF#2 forwards the 200 OK final response to BGCF#1.

Table 7.3.7.1-32: 200 OK (BGCF to BGCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP bgcf1.home.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=

```

33. 200 OK (BGCF to S-CSCF) – see example in table 7.3.7.1-33

BGCF#1 forwards the 200 OK final response to S-CSCF.

Table 7.3.7.1-33: 200 OK (BGCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=

```

34. Service Control

S-CSCF performs whatever service control logic is appropriate for this session completion.

35. 200 OK (S-S#4 to MO) – see example in table 7.3.7.1-35

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 7.3.7.1-35: 200 OK (S-S#4 to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=

```

36. ACK (MO to S-S#4) – see example in table 7.3.7.1-36

The originating endpoint sends the final acknowledgement to S-CSCF by the origination procedures.

Table 7.3.7.1-36: ACK (MO to S-S#4)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

37. ACK (S-CSCF to MGCF) – see example in table 7.3.7.1-37

S-CSCF forwards the ACK request to the MGCF.

Table 7.3.7.1-37: ACK (S-CSCF to MGCF)

```

ACK sip:mgcf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.4 Termination procedures

7.4.1 Introduction

This subclause presents the detailed signalling flows to define the procedures for session terminations.

The session termination procedures specify the signalling path between the S-CSCF assigned to perform the session termination service and the UE. This signalling path is determined at the time of UE registration, and remains fixed for the life of the registration. This signalling path is the reverse of the session initiation signalling path of subclause 7.2.

Therefore there is a one-to-one correspondence between the origination procedures of subclause 7.2 and the termination procedures of this subclause.

A UE always has a proxy (P-CSCF) associated with it. This P-CSCF is located in the same network as the UE, and performs resource authorization for the sessions to the UE. The P-CSCF is determined by the CSCF discovery process, described in subclause 5.2.1.

As a result of the registration procedure, the P-CSCF knows the address of the UE. The assigned S-CSCF, in the home network, knows the name/address of the P-CSCF. If the network operator owning the S-CSCF wants to keep their configuration private, the S-CSCF will have chosen an Interrogating-CSCF, I-CSCF, who will perform the THIG functions and pass messages to the P-CSCF (procedure MT#1b).

Sessions destined to the PSTN are a special case of the Termination procedures. Two of the S-CSCF to S-CSCF procedures deal specifically with PSTN termination, and route the session signalling through a BGCF that allocates a MGCF. The MGCF uses H.248/MEGACO to control a Media Gateway, and communicates with SS7 network. In case of interworking between IP based and SS7 based signalling network is required, a SGW would be used [2]. The MGCF receives and processes SIP requests, and subsequent nodes consider the signalling as if it came from a S-CSCF.

7.4.2 MT#1a

7.4.2.1 (MT#1a) Mobile termination, roaming (MO#1a, S-S#1a assumed)

Figure 7.4.2.1 shows a termination procedure which applies to roaming subscribers when the home network operator does not desire to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the P-CSCF discovery procedure. During registration, the home network allocates the S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF and the UE Contact address, and P-CSCF obtains the name/address of the UE.

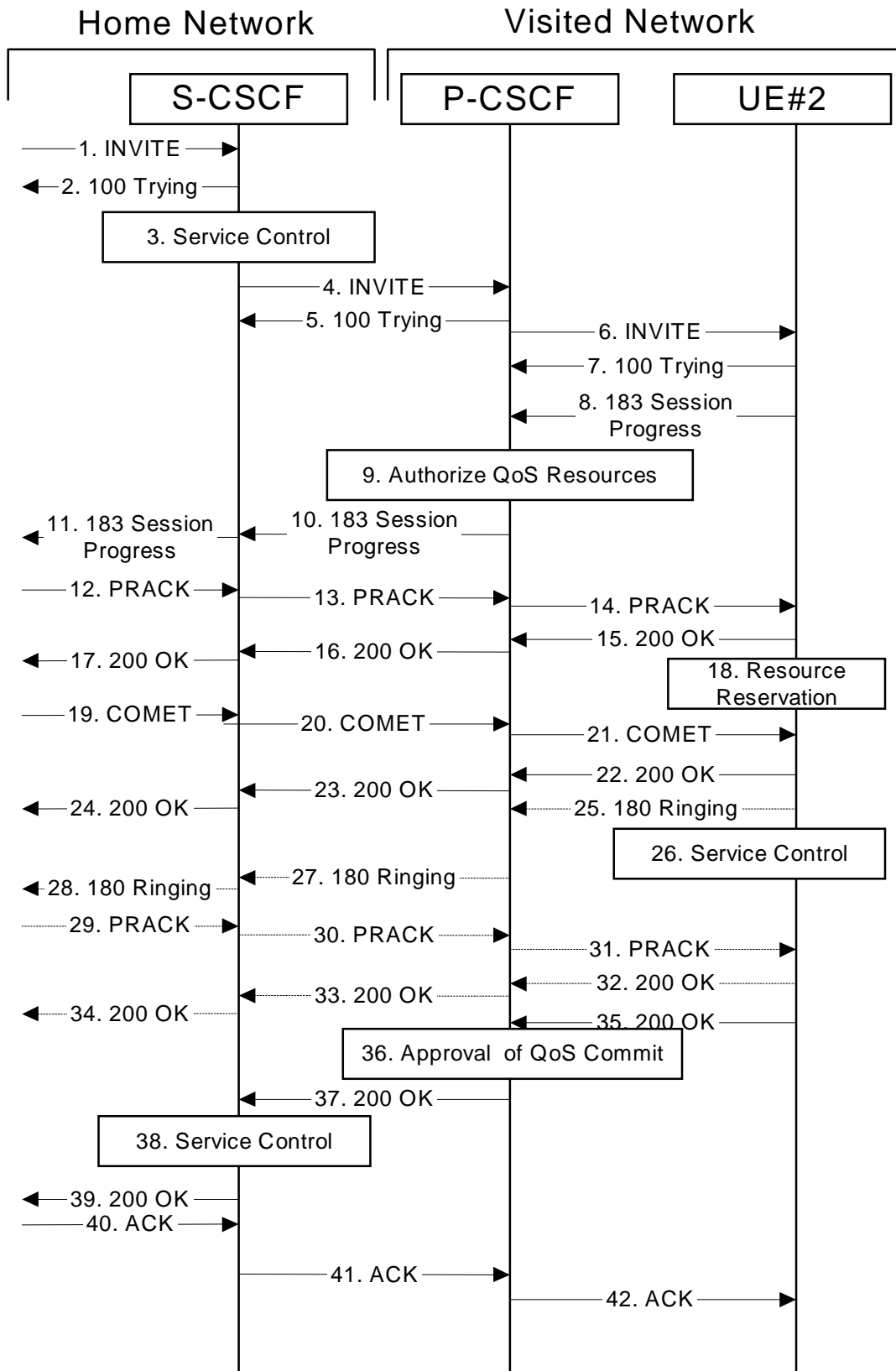


Figure 7.4.2.1-1: MT#1a

Procedure MT#1a is as follows:

1. INVITE (S-S to MT#1a) – see example in table 7.4.2.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 7.4.2.1-1: INVITE (S-S to MT#1a)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

SDP

The SDP contains the complete set of supported codecs from the session originator, as restricted by the originating network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Upon receipt of the INVITE, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 7.4.2.1-1b.

Table 7.4.2.1-1b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home2.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net,
    sip:[5555::aaa:bbb:ccc:ddd]
Route(2dest): sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]

```

2. 100 Trying (MT#1a to S-S) – see example in table 7.4.2.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.2.1-2: 100 Trying (MT#1a to S-S)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

4. INVITE (S-CSCF to P-CSCF) – see example in table 83.2-4

S-CSCF remembers (from the registration procedure) the UE Contact address and the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF.

Table 7.4.2.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

Request-URI: Built from the registration information.

- Route:** Built from the Contact address stored at registration.
- P-Called-Party-ID:** Includes the dialled URL with its parameters.
- Via/Record-Route:** S-CSCF adds itself.
- SDP** The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the second audio stream shows a port number zero, which removes it from the negotiation.

Upon receipts of the INVITE, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is – see example in table 7.4.2.1-4b.

Table 7.4.2.1-4b: Storage of information at P-CSCF

```
Request-URI: sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:[5555::eee:fff:aaa:bbb]
Route(2orig): sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
sip:240f34.1@pcscf1.visited1.net
```

5. 100 Trying (P-CSCF to S-CSCF) – see example in table 7.4.2.1-5

P-CSCF responds to the INVITE request (4) with a 100 Trying provisional response.

Table 7.4.2.1-5: 100 Trying (P-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. INVITE (P-CSCF to UE) – see example in table 7.4.2.1-6

P-CSCF examines the media parameters, and removes any that the network operator decides, based on local policy, not to allow on the network.

For this example, assume the network operator does not allow 64 kb/s audio, so the PCMU codec is removed.

The P-CSCF extract the UE address from the Route header value and place it into the Request-URI.

Table 7.4.2.1-6: INVITE (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c02013331533134363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4 96 15
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15

```

P-CSCF removes the Record-Route and Via headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
      sip:240f34.1@pcscf1.visited1.net

```

- Via:** P-CSCF removes the Via headers, and generates a locally unique token to identify the saves values. It inserts this as a branch value on its Via header.
- Media-Authorization:** A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".
- SDP** The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the first audio stream no longer contains codec "0" (PCMU), which removes it from the negotiation.

7. 100 Trying (UE to P-CSCF) – see example in table 7.4.2.1-7

UE may optionally send a 100 Trying provisional response to P-CSCF.

Table 7.4.2.1-7: 100 Trying (UE to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. 183 Session Progress (UE to P-CSCF) – see example in table 7.4.2.1-8

UE#2 determines the complete set of codecs that it is capable of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE request. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

For this example, assume UE#2 supports both AMR and G726, but not G728 (code 15).

UE responds with a 183 Session Progress response containing SDP back to the originator. This SDP may represent one or more media for a multimedia session. This response is sent to P-CSCF.

Table 7.4.2.1-8: 183 Session Progress (UE to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

- Remote-Party-ID:** Identifies the answering subscriber. It contains the public user identity, and the name of the answering party.
- To:** A tag is added to the To header.
- Contact:** Header identifies the IP address or FQDN of the UE.
- SDP** The SDP contains the subset of codecs supported by UE. It requests a confirmation of the QoS preconditions for establishing the session

9. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session.

10. 183 Session Progress (P-CSCF to S-CSCF) – see example in table 7.4.2.1-10

P-CSCF forwards the 183 Session Progress response to S-CSCF.

Table 7.4.2.1-10: 183 Session Progress (P-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

Via/Record-Route: P-CSCF restores the Via headers and Record-Route headers from the branch value in its Via.

11. 183 Session Progress (MT#1a to S-S) – see example in table 7.4.2.1-11

S-CSCF forwards the 183 Session Progress response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-11: 183 Session Progress (MT#1a to S-S)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```


12. PRACK (S-S to MT#1a) – see example in table 7.4.2.1-12

The originating endpoint sends a PRACK request containing the final SDP to be used in this session, via the S-CSCF to S-CSCF procedure, to S-CSCF.

Table 7.4.2.1-12: PRACK (S-S to MT#1a)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

13. PRACK (S-CSCF to P-CSCF) – see example in table 7.4.2.1-13

S-CSCF forwards the PRACK request to P-CSCF.

Table 7.4.2.1-13: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

14. PRACK (P-CSCF to UE) – see example in table 7.4.2.1-14

P-CSCF forwards the PRACK request to UE.

Table 7.4.2.1-14: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

15. 200 OK (UE to P-CSCF) – see example in table 7.4.2.1-15

UE acknowledges the PRACK request (14) with a 200 OK response.

Table 7.4.2.1-15: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

16. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.2.1-16

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.2.1-16: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

17. 200 OK (MT#1a to S-S) – see example in table 7.4.2.1-17

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-17: 200 OK (MT#1a to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

18. Resource Reservation

UE initiates the reservation procedures for the resources needed for this session.

19. COMET (S-S to MT#1a) – see example in table 7.4.2.1-19

When the originating endpoint has completed its resource reservation, it sends the COMET request to S-CSCF, via the S-CSCF to S-CSCF procedures.

Table 7.4.2.1-19: COMET (S-S to MT#1a)

```
COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:succes sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

20. COMET (S-CSCF to P-CSCF) – see example in table 7.4.2.1-20

S-CSCF forwards the COMET request to P-CSCF.

Table 7.4.2.1-20: COMET (S-CSCF to P-CSCF)

```

COMET sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

21. COMET (P-CSCF to UE) – see example in table 7.4.2.1-21

P-CSCF forwards the COMET request to UE.

Table 7.4.2.1-21: COMET (P-CSCF to UE)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

22. 200 OK (UE to P-CSCF) – see example in table 7.4.2.1-22

UE acknowledges the COMET request (21) with a 200 OK response.

Table 7.4.2.1-22: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

23. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.2.1-23

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.2.1-23: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

24. 200 OK (MT#1a to S-S) – see example in table 7.4.2.1-24

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-24: 200 OK (MT#1a to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

25. 180 Ringing (UE to P-CSCF) – see example in table 7.4.2.1-25

Before proceeding with session establishment, the UE waits for two events. First, the resource reservation initiated in step #18 must complete successfully. Second, the resource reservation initiated by the originating endpoint must complete successfully (which is indicated by message #21 received by UE). The UE may now immediately accept the session (and proceed with step #35), or alert the destination subscriber of an incoming session attempt; if the latter it indicates this to the calling party by a 180 Ringing provisional response sent to P-CSCF.

Table 7.4.2.1-25: 180 Ringing (UE to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

26. 180 Ringing (P-CSCF to S-CSCF) – see example in table 7.4.2.1-26

P-CSCF forwards the 180 Ringing response to S-CSCF.

Table 7.4.2.1-26: 180 Ringing (P-CSCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net,sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

27. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

28. 180 Ringing (MT#1a to S-S) – see example in table 7.4.2.1-28

S-CSCF forwards the 180 Ringing response to the originating endpoint, per the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-28: 180 Ringing (MT#1a to S-S)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited.net, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

29. PRACK (S-S to MT#1a) – see example in table 7.4.2.1-29

The originator acknowledges the 180 Ringing response (28) with a PRACK request.

Table 7.4.2.1-29: PRACK (S-S to MT#1a)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0

```

30. PRACK (S-CSCF to P-CSCF) – see example in table 7.4.2.1-30

S-CSCF forwards the PRACK request to P-CSCF.

Table 7.4.2.1-30: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

31. PRACK (P-CSCF to UE) – see example in table 7.4.2.1-31

P-CSCF forwards the PRACK request to UE.

Table 7.4.2.1-31: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

32. 200 OK (UE to P-CSCF) – see example in table 7.4.2.1-32

UE acknowledges the PRACK request (31) with a 200 OK response.

Table 7.4.2.1-32: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

33. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.2.1-33

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.2.1-33: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

34. 200 OK (MT#1a to S-S) – see example in table 7.4.2.1-34

S-CSCF forwards the 200 OK response to the session originator, per the S-CSCF to S-CSCF procedures.

Table 7.4.2.1-34: 200 OK (MT#1a to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. 200 OK (UE to P-CSCF) – see example in table 7.4.2.1-35

When the called party answers the UE sends a 200 OK final response to the INVITE request (6) to P-CSCF, and starts the media flow(s) for this session.

Table 7.4.2.1-35: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

36. Approval of QoS Commit

The P-CSCF approves the commitment of the QoS resources.

37. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.2.1-37

P-CSCF indicates the resources reserved for this session should now be committed, and sends the 200 OK final response to S-CSCF.

Table 7.4.2.1-37: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

38. Service Control

S-CSCF performs whatever service control is required for the session completion.

39. 200 OK (MT#1a to S-S) – see example in table 7.4.2.1-39

S-CSCF forwards the 200 OK final response along the signalling path back to the session originator, as per the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-39: 200 OK (MT#1a to S-S)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

40. ACK (S-S to MT#1a) – see example in table 7.4.2.1-40

The calling party responds to the 200 OK final response (39) with an ACK request which is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 7.4.2.1-40: ACK (S-S to MT#1a)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0

```

41. ACK (S-CSCF to P-CSCF) – see example in table 7.4.2.1-41

S-CSCF forwards the ACK request to P-CSCF.

Table 7.4.2.1-41: ACK (S-CSCF to P-CSCF)

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

42. ACK (P-CSCF to UE) – see example in table 7.4.2.1-42

P-CSCF forwards the ACK request to UE.

Table 7.4.2.1-42: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

7.4.2.2 UE-detected failure/resource failure

The subscriber that initiated a session with one of the MO procedures had the attempt fail due to an error detected in the Termination procedure. This could be due to, for example, destination busy (error code 486), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, MT#1a could be at many different stages in the session establishment procedure. This is shown in figure 7.4.2.2-1, as optional messages 7-33 that may appear in this error procedure.

This subclause also includes the procedures for the terminating UE to indicate a failure to allocate required resources for the session. This is detected in step #18 and reported with a 580-Precondition-Failure error response.

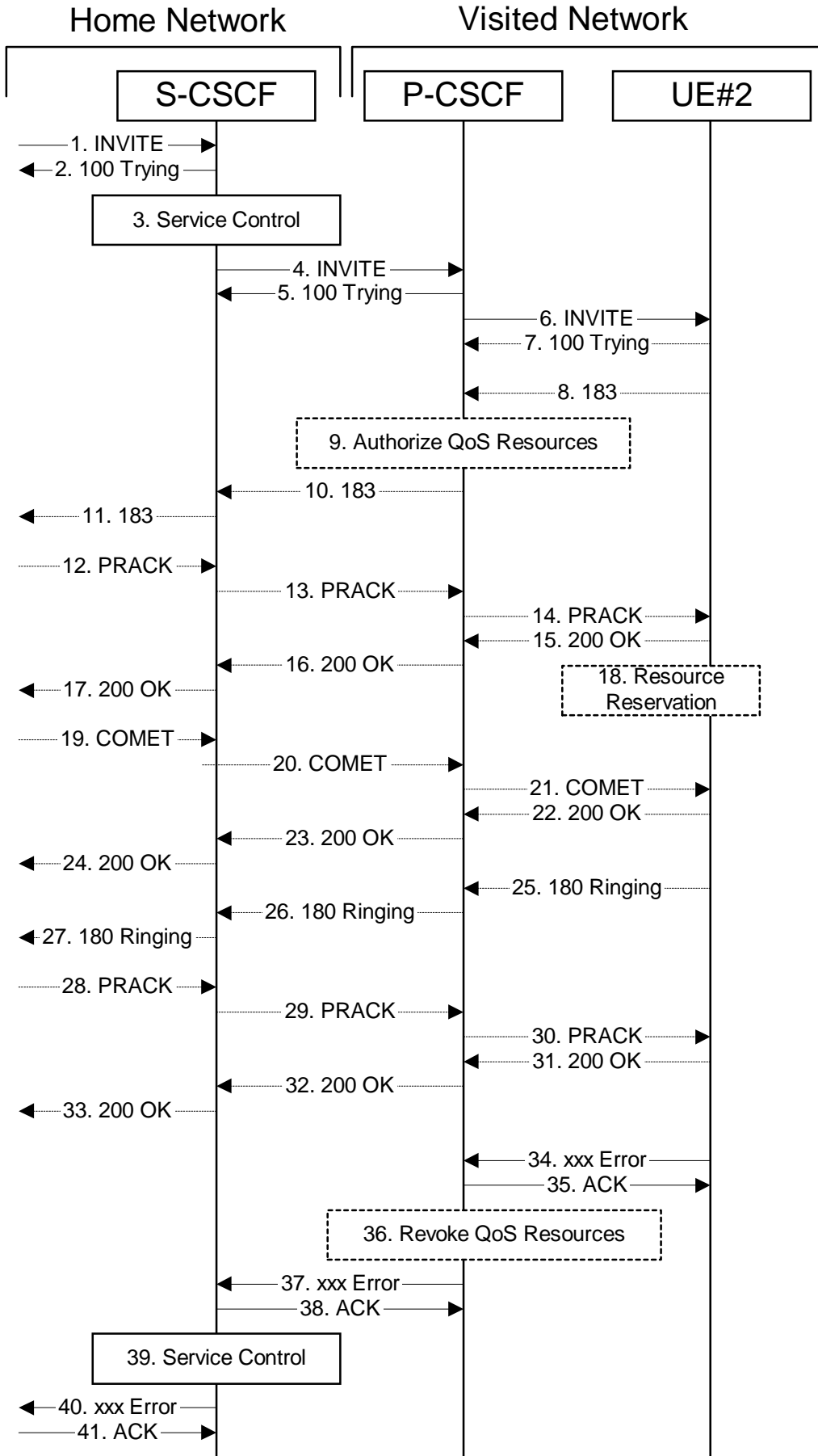


Figure 7.4.2.2-1: Failure in termination procedure

1-6. INVITE (S-S to S-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.4.2.1.

7-33.100 Trying (S-CSCF to S-S) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.4.2.1.

34. xxx Error (UE to P-CSCF) – see example in table 7.4.2.2-34

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", "580 Precondition Failure", or others. For this example, "486 Busy" is shown.

Table 7.4.2.2-34: 486 Busy Here (UE to P-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

35. ACK (P-CSCF to UE) – see example in table 7.4.2.2-35

Upon receive the 486 response from the UE, P-CSCF sends ACK.

Table 7.4.2.2-35: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

36. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

37. xxx Error (P-CSCF to S-CSCF) – see example in table 7.4.2.2-37 (related to table 7.4.2.2-34)

The P-CSCF returned a SIP error response to S-CSCF.

NOTE 2: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.4.2.2-37: 486 Busy Here (P-CSCF to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0
```

38. ACK (S-CSCF to P-CSCF) – see example in table 7.4.2.2-38

Upon receive the 486 response from the P-CSCF procedure, S-CSCF sends ACK.

Table 7.4.2.2-38: ACK (S-CSCF to P-CSCF)

```
ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

39. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

40. xxx Error (S-CSCF to S-S) – see example in table 7.4.2.2-40 (related to table 7.4.2.2-37)

The S-CSCF returned a SIP error response to the appropriate S-S procedure.

NOTE 3: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 7.4.2.2-40: 486 Busy Here (S-CSCF to S-S)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

41. ACK (S-S to S-CSCF) – see example in table 7.4.2.2-41

Upon receive the 486 response from the S-CSCF, the S-S procedure sends ACK.

Table 7.4.2.2-41: ACK (S-S to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.4.2.3 Origination failure

After sending the initial INVITE for a multimedia session, the originating endpoint either abandoned the attempt or was unable to obtain the resources necessary for the session. The termination procedure is informed of this by a CANCEL request from the originator, which is shown in figure 7.4.2.3-1.

If the session is aborted due to failure to obtain resources by the originator, it will occur prior to step #19; steps 19-33 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 8-33.

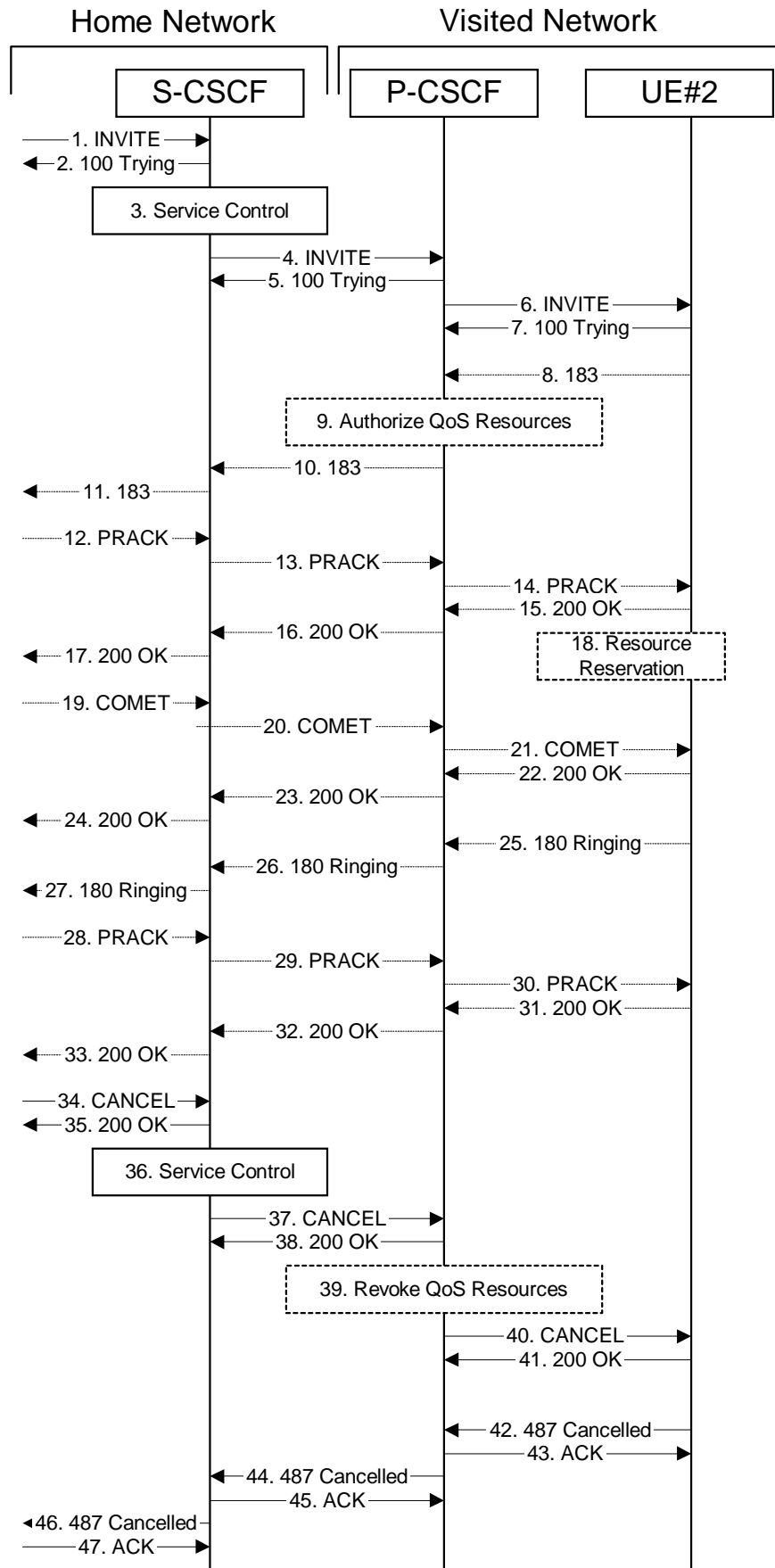


Figure 7.4.2.3-1: Failure in origination procedure

1-7. INVITE (S-S to S-CSCF) et seq

UE#1 initiated a session, as described in subclause 7.4.2.1.

8-33.183 SDP (UE to S-CSCF) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 7.4.2.1.

34. CANCEL (S-S to S-CSCF) – see example in table 7.4.2.3-34

The originator, through the S-S procedure, cancelled the original INVITE request.

Table 7.4.2.3-34: CANCEL (S-S to S-CSCF)

```
CANCEL sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0
```

35. 200 OK (S-CSCF to S-S) – see example in table 7.4.2.3-35

Upon receive the CANCEL request from the S-S procedure, S-CSCF sends 200 OK.

Table 7.4.2.3-35: 200 OK (S-CSCF to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

36. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

37. CANCEL (S-CSCF to P-CSCF) – see example in table 7.4.2.3-37

The S-CSCF forwards the CANCEL request to P-CSCF.

Table 7.4.2.3-37: CANCEL (S-CSCF to P-CSCF) (related to 7.4.2.3-34)

```
CANCEL sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length:
```

38. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.2.3-38

Upon receiving the CANCEL request from the S-CSCF, P-CSCF sends 200 OK.

Table 7.4.2.3-38: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

39. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

40. CANCEL (P-CSCF to UE) – see example in table 7.4.2.3-40 (related to table 7.4.2.3-37)

The P-CSCF forwards the CANCEL request to the UE.

Table 7.4.2.3-40: CANCEL (P-CSCF to UE)

```
CANCEL sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

41. 200 OK (UE to P-CSCF) – see example in table 7.4.2.3-41

Upon receive the CANCEL request from the P-CSCF, the UE sends 200 OK.

Table 7.4.2.3-41: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

42. 487 Cancelled (UE to P-CSCF) – see example in table 7.4.2.3-42

The termination procedure performed the cancel operation, and returned a SIP error response to the initial INVITE request.

Table 7.4.2.3-42: 487 Cancelled (UE to P-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

43. ACK (P-CSCF to UE) – see example in table 7.4.2.3-43

Upon receive the 487 response from the UE, P-CSCF sends ACK.

Table 7.4.2.3-43: ACK (P-CSCF to UE)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

44. 487 Cancelled (P-CSCF to S-CSCF) – see example in table 7.4.2.3-44 (related to table 7.4.2.3-42)

The P-CSCF returned a SIP error response to S-CSCF.

Table 7.4.2.3-44: 487 Cancelled (P-CSCF to S-CSCF)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After:3600
Content-Length: 0

```

45. ACK (S-CSCF to P-CSCF) – see example in table 7.4.2.3-45

Upon receive the 487 response from the P-CSCF procedure, S-CSCF sends ACK.

Table 7.4.2.3-45: ACK (S-CSCF to P-CSCF)

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0

```

46. 487 Cancelled (S-CSCF to S-S) – see example in table 7.4.2.3-46 (related to table 7.4.2.3-44)

The S-CSCF returned a SIP error response to the appropriate S-S procedure.

Table 7.4.2.3-46: 487 Cancelled (S-CSCF to S-S)

```

SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After: 3600
Content-Length: 0

```

47. ACK (S-S to S-CSCF) – see example in table 7.4.2.3-47

Upon receive the 487 response from the S-CSCF, the S-S procedure sends ACK.

Table 7.4.2.3-47: ACK (S-S to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

7.4.2.4 Mobile termination, roaming, terminal is out of radio coverage (MO#2, S-S#2 assumed)

An example of this flow is not shown in the present document.

7.4.3 MT#2

7.4.3.1 (MT#2) Mobile termination, located in home network (MO#2, S-S#2 assumed)

Figure 7.4.3.1-1 shows a termination procedure which applies to subscribers located in their home service area.

The UE is located in the home network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates a S-CSCF in the home network, S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.

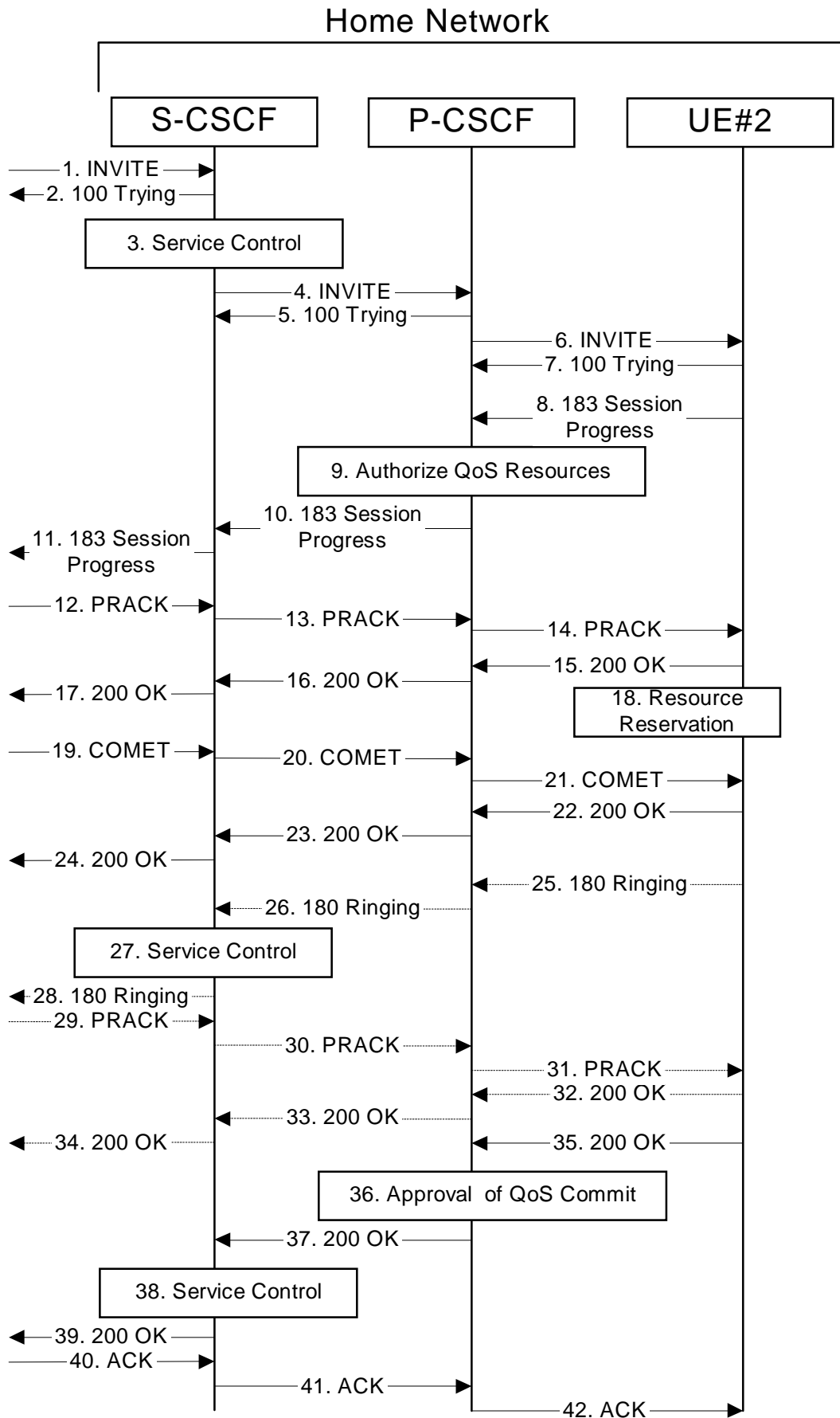


Figure 7.4.3.1-1: MT#2

Procedure MT#2 is as follows:

1. INVITE (S-S to MT#2) – see example in table 7.4.3.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 7.4.3.1-1: INVITE (S-S to MT#2)

```

INVITE sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

SDP

The SDP contains the complete set of supported codecs from the session originator, as restricted by the originating network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Upon receipt of the INVITE, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 7.4.3.1-1b.

Table 7.4.3.1-1b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home2.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:223b23.1@scscf1.home1.net, sip:pcscf1.home1.net,
sip:[5555::aaa:bbb:ccc:ddd]
Route(2dest): sip:pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]

```

2. 100 Trying (MT#2 to S-S) – see example in table 7.4.3.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.3.1-2: 100 Trying (MT#2 to S-S)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

4. INVITE (S-CSCF to P-CSCF) – see example in table 7.4.3.1-4

S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

Table 7.4.3.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

Request-URI: Built from the registration information.

Route: Built from the Contact address stored at registration.

P-Called-Party-ID: Includes the dialled URL with its parameters.

Via:, Record-Route: S-CSCF adds itself in the Record-Route and Via headers.

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the second audio stream shows a port number zero, which removes it from the negotiation.

Upon receipt of the INVITE, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is – see example in table 7.4.3.1-4b.

Table 7.4.3.1-4b: Storage of information at P-CSCF

```
Request-URI: sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:[5555::eee:fff:aaa:bbb]
Route(2orig): sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net
```

5. 100 Trying (P-CSCF to S-CSCF) – see example in table 7.4.3.1-5

P-CSCF responds to the INVITE request (4) with a 100 Trying provisional response.

Table 7.4.3.1-5: 100 Trying (P-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. INVITE (P-CSCF to UE) – see example in table 7.4.3.1-6

P-CSCF examines the media parameters, and removes any that the network operator decides, based on local policy, not to allow on the network.

For this example, assume the network operator does not allow 64 kb/s audio, so the PCMU codec is removed.

The P-CSCF extract the UE address from the Route header value and place it into the Request-URI.

Table 7.4.3.1-6: INVITE (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c02013331533134363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4 96 15
a=qos:mandatory sendrecv
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtptime:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15

```

P-CSCF removes the Record-Route and Via headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
      sip:431h23.1@pcscf1.home1.net

```

- Via:** P-CSCF removes the Via headers, and generates a locally unique token to identify the saves values. It inserts this as a branch value on its Via header.
- Media-Authorization:** A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".
- SDP** The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the first audio stream no longer contains codec "0" (PCMU), which removes it from the negotiation.

7. 100 Trying (UE to P-CSCF) – see example in table 7.4.3.1-7

UE may optionally send a 100 Trying provisional response to P-CSCF.

Table 7.4.3.1-7: 100 Trying (UE to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. 183 Session Progress (UE to P-CSCF) – see example in table 7.4.3.1-8

UE#2 determines the complete set of codecs that it is capable of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE request. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

For this example, assume UE#2 supports both AMR and G726, but not G728 (code 15).

UE responds with a 183 Session Progress response containing SDP back to the originator. This SDP may represent one or more media for a multimedia session. This response is sent to P-CSCF.

Table 7.4.3.1-8: 183 Session Progress (UE to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

Remote-Party-ID:	Identifies the answering subscriber. It contains the public user identity, and the name of the answering party.
To:	A tag is added to the To header.
Contact:	Is the SIP URL that contains the IP address or FQDN of the terminating UE.
SDP	The SDP contains the subset of codecs supported by UE. It requests a confirmation of the QoS preconditions for establishing the session

9. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session.

10. 183 Session Progress (P-CSCF to S-CSCF) – see example in table 7.4.3.1-10

P-CSCF forwards the 183 Session Progress response to S-CSCF.

Table 7.4.3.1-10: 183 Session Progress (P-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

P-CSCF restores the Via headers and Record-Route headers from the branch value in its Via.

11. 183 Session Progress (MT#2 to S-S) – see example in table 7.4.3.1-11

S-CSCF forwards the 183 Session Progress response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-11: 183 Session Progress (MT#2 to S-S)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

12. PRACK (S-S to MT#2) – see example in table 7.4.3.1-12

The originating endpoint sends a PRACK request containing the final SDP to be used in this session, via the S-CSCF to S-CSCF procedure, to S-CSCF.

Table 7.4.3.1-12: PRACK (S-S to MT#2)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

13. PRACK (S-CSCF to P-CSCF) – see example in table 7.4.3.1-13

S-CSCF forwards the PRACK request to P-CSCF.

Table 7.4.3.1-13: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

14. PRACK (P-CSCF to UE) – see example in table 7.4.3.1-14

P-CSCF forwards the PRACK request to UE.

Table 7.4.3.1-14: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

15. 200 OK (UE to P-CSCF) – see example in table 7.4.3.1-15

UE acknowledges the PRACK request (14) with a 200 OK response.

Table 7.4.3.1-15: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

16. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.3.1-16

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.3.1-16: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

17. 200 OK (MT#2 to S-S) – see example in table 7.4.3.1-17

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-17: 200 OK (MT#2 to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]

From:
To:
Call-ID:
CSeq:
Content-Length:
```

18. Resource Reservation

UE initiates the reservation procedures for the resources needed for this session.

19. COMET (S-S to MT#2) – see example in table 7.4.3.1-19

When the originating endpoint has completed its resource reservation, it sends the COMET request to S-CSCF, via the S-CSCF to S-CSCF procedures.

Table 7.4.3.1-19: COMET (S-S to MT#2)

```
COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmt:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

20. COMET (S-CSCF to P-CSCF) – see example in table 7.4.3.1-20

S-CSCF forwards the COMET request to P-CSCF.

Table 7.4.3.1-20: COMET (S-CSCF to P-CSCF)

```

COMET sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

21. COMET (P-CSCF to UE) – see example in table 7.4.3.1-21

P-CSCF forwards the COMET request to UE.

Table 7.4.3.1-21: COMET (P-CSCF to UE)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

22. 200 OK (UE to P-CSCF) – see example in table 7.4.3.1-22

UE acknowledges the COMET request (21) with a 200 OK response.

Table 7.4.3.1-22: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

23. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.3.1-23

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.3.1-23: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

24. 200 OK (MT#2 to S-S) – see example in table 7.4.3.1-24

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-24: 200 OK (MT#2 to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

25. 180 Ringing (UE to P-CSCF) – see example in table 7.4.3.1-25

Before proceeding with session establishment, the UE waits for two events. First, the resource reservation initiated in step #18 must complete successfully. Second, the resource reservation initiated by the originating endpoint must complete successfully (which is indicated by message #21 received by UE). The UE may now immediately accept the session (and proceed with step #35), or alert the destination subscriber of an incoming session attempt; if the latter it indicates this to the calling party by a 180 Ringing provisional response sent to P-CSCF.

Table 7.4.3.1-25: 180 Ringing (UE to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

26. 180 Ringing (P-CSCF to S-CSCF) – see example in table 7.4.3.1-26

P-CSCF forwards the 180 Ringing response to S-CSCF.

Table 7.4.3.1-26: 180 Ringing (P-CSCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

27. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

28. 180 Ringing (MT#2 to S-S) – see example in table 7.4.3.1-28

S-CSCF forwards the 180 Ringing response to the originating endpoint, per the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-28: 180 Ringing (MT#2 to S-S)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

29. PRACK (S-S to MT#2) – see example in table 7.4.3.1-29

The originator acknowledges the 180 Ringing response (28) with a PRACK request.

Table 7.4.3.1-29: PRACK (S-S to MT#2)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0

```

30. PRACK (S-CSCF to P-CSCF) – see example in table 7.4.3.1-30

S-CSCF forwards the PRACK request to P-CSCF.

Table 7.4.3.1-30: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

31. PRACK (P-CSCF to UE) – see example in table 7.4.3.1-31

P-CSCF forwards the PRACK request to UE.

Table 7.4.3.1-31: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

32. 200 OK (UE to P-CSCF) – see example in table 7.4.3.1-32

UE acknowledges the PRACK request (31) with a 200 OK response.

Table 7.4.3.1-32: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

33. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.3.1-33

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.4.3.1-33: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

34. 200 OK (MT#2 to S-S) – see example in table 7.4.3.1-34

S-CSCF forwards the 200 OK response to the session originator, per the S-CSCF to S-CSCF procedures.

Table 7.4.3.1-34: 200 OK (MT#2 to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. 200 OK (UE to P-CSCF) – see example in table 7.4.3.1-35

When the called party answers, the UE sends a 200 OK final response to the INVITE request (6) to P-CSCF, and starts the media flow(s) for this session.

Table 7.4.3.1-35: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

36. Approval of QoS Commit

The P-CSCF approves the commitment of the QoS resources.

37. 200 OK (P-CSCF to S-CSCF) – see example in table 7.4.3.1-37

P-CSCF indicates the resources reserved for this session should now be committed, and sends the 200 OK final response to S-CSCF.

Table 7.4.3.1-37: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

38. Service Control

S-CSCF performs whatever service control is required for the session completion.

39. 200 OK (MT#2 to S-S) – see example in table 7.4.3.1-39

S-CSCF forwards the 200 OK final response along the signalling path back to the session originator, as per the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-39: 200 OK (MT#2 to S-S)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

40. ACK (S-S to MT#2) – see example in table 7.4.3.1-40

The calling party responds to the 200 OK final response (39) with an ACK request which is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 7.4.3.1-40: ACK (S-S to MT#2)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0

```

41. ACK (S-CSCF to P-CSCF) – see example in table 7.4.3.1-41

S-CSCF forwards the ACK request to P-CSCF.

Table 7.4.3.1-41: ACK (S-CSCF to P-CSCF)

```

ACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

42. ACK (P-CSCF to UE) – see example in table 7.4.3.1-42

P-CSCF forwards the ACK request to UE.

Table 7.4.3.1-42: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

7.4.3.2 UE-detected failure/resource failure (not provided)

An example of this flow is not shown in the present document.

7.4.3.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

7.4.4 CS-T**7.4.4.1 (CS-T) CS Networks termination (MO#2, S-S#3 assumed)**

Figure 7.4.4.1-1 shows the MGCF in the IM CN subsystem, which is a SIP endpoint that initiates and receives requests on behalf of the CS Networks and Media Gateway (MGW). Other nodes consider the signalling as if it came from a S-CSCF. The MGCF incorporates the network security functionality of the S-CSCF.

Agreements between network operators may allow CS Networks termination in a network other than the originator's home network. This may be done, for example, to avoid long distance or international tariffs.

This termination procedure can be used in either S-S#3 or S-S#4.

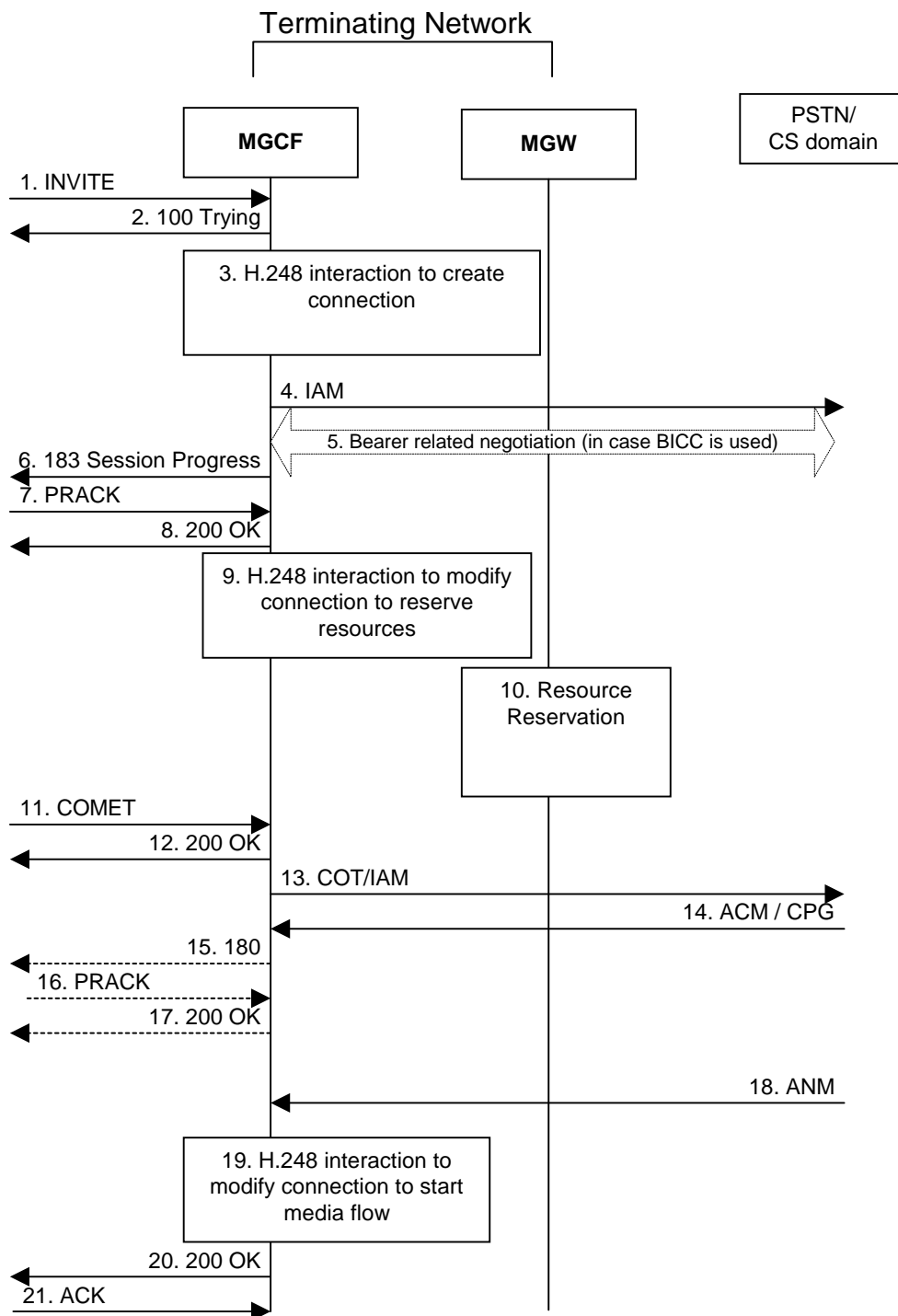


Figure 7.4.4.1-1: CS Networks termination

The CS Networks termination procedure is as follows:

1. INVITE (S-S to CS-T) – see example in table 7.4.4.1-1

MGCF receives an INVITE request, through one of the origination procedures and via one of the S-CSCF to S-CSCF procedures.

Table 7.4.4.1-1: INVITE (S-S to CS-T)

```

INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

MGCF calculates the proper Route header to add to future requests, and saves that information. The saved value of the Route header is:

```

Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net,
sip:[5555::aaa:bbb:ccc:ddd]

```

SDP The SDP contains the desired set of supported codecs from the session originator, as restricted by the originating network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

2. 100 Trying (CS-T to S-S) – see example in table 7.4.4.1-2

MGCF may respond to the INVITE request with a 100 Trying provisional response.

Table 7.4.4.1-2: 100 Trying (CS-T to S-S)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. H.248 Interaction to Create Connection

MGCF initiates a H.248 interaction to pick an outgoing channel and determine media capabilities of the MGW.

4. SS7: IAM

Based on the continuity support of the outgoing channel selected, MGCF may decide to send an IAM message out to the CS Networks at this point. In case the outgoing channel does not support continuity indication, MGCF sends out an IAM message only in step 14.

5. Possible bearer related negotiation takes place (in case BICC is used)

6. 183 Session Progress (CS-T to S-S) – see example in table 7.4.4.1-6

MGCF determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with a 183 Session Progress response back to the originator. This response is sent via the S-CSCF to S-CSCF procedure.

NOTE: in order to be able to send the IAM message at step 4, the MGCF has to select one media from the SDP received in INVITE.

Table 7.4.4.1-6: 183 Session Progress (CS-T to S-S)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
Remote-Party-ID: <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:mgcf1.home1.net
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

7. PRACK (S-S to CS-T) – see example in table 7.4.4.1-7

The originating endpoint sends a PRACK request containing the final SDP to be used in this session, via the S-CSCF to S-CSCF procedure, to MGCF.

Table 7.4.4.1-7: PRACK (S-S to CS-T)

```
PRACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
```

```

m-video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

8. 200 OK (CS-T to S-S) – see example in table 7.4.4.1-8

MGCF acknowledges the PRACK request (8) with a 200 OK response.

Table 7.4.4.1-8: 200 OK (CS-T to S-S)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

9. H.248 Interaction to Modify Connection

MGCF initiates a H.248 interaction to modify the connection established in step #3 and instruct MGW to reserve the resources necessary for the media streams.

10. Resource Reservation

MGW reserved the resources necessary for the media streams.

11. COMET (S-S to CS-T) – see example in table 7.4.4.1-11

When the originating endpoint has completed its resource reservation, it sends the COMET request to MGCF, via the S-CSCF to S-CSCF procedures.

Table 7.4.4.1-11: COMET (S-S to CS-T)

```

COMET sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgklj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

12. 200 OK (CS-T to S-S) – see example in table 7.4.4.1-12

MGCF acknowledges the COMET request (12) with a 200 OK response.

Table 7.4.4.1-12: 200 OK (CS-T to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

13. SS7: COT/IAM

Based on the continuity support of the outgoing channel selected MGCF sends a IAM or COT message to the CS Networks. In case the outgoing channel supports continuity indication, MGCF has already sent out the IAM message in step 4, and at this point sends out a COT message.

14. SS7: ACM/CPG

The CS Networks establishes the path to the destination. In the present case the CS Networks responds with an ACM message containing a "subscriber free" indication, implying that the called party is being alerted.

15. 180 (CS-T to S-S) – see example in table 7.4.4.1-15

If the CS Network is alerting the destination user, MGCF indicates this to the calling party by a 180 Ringing provisional response. This response is sent via the S-CSCF to S-CSCF procedures.

As the indication of called party being alerted ("subscriber free" indication) may not be available in ACM, the 180 Ringing is only sent when the indication is available. An ACM without the "subscriber free" indication will not trigger any SIP message.

Table 7.4.4.1-15: 180 Ringing (CS-T to S-S)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf1.home1.net
RSeq: 9022
Content-Length: 0
```

The 180 Ringing is used when the ACM has indicated that the called party is being alerted.

16. PRACK (S-S to CS-T) – see example in table 7.4.4.1-16

The originator acknowledges the 180 Ringing provisional response (16) with a PRACK request.

Table 7.4.4.1-16: PRACK (S-S to CS-T)

```
PRACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

17. 200 OK (CS-T to S-S) – see example in table 7.4.4.1-17

MGCF acknowledges the PRACK request (17) with a 200 OK response.

Table 7.4.4.1-17: 200 OK (CS-T to S-S)


```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

18. SS7: ANM

When the called party answers, the CS Network sends an ANM message to the MGCF.

19. H.248: Interaction to Modify Connection

MGCF initiates a H.248 interaction to make the connection in the MGW bi-directional.

20. 200 OK (CS-T to S-S) – see example in table 7.4.4.1-20

MGCF sends a 200 OK final response along the signalling path back to the session originator.

Table 7.4.4.1-20: 200 OK (CS-T to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP bgcf1.home1.net;branch=6546q2.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:mgcf1.home1.net
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

21. ACK (S-S to CS-T) – see example in table 7.4.4.1-21

The Calling party acknowledges the final response (20) with an ACK request.

Table 7.4.4.1-21: ACK (S-S to CS-T)

```
ACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0
```

7.4.4.2 MGCF-detected failure/resource failure (not provided)

An example of this flow is not shown in the present document.

7.4.4.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

7.4.5 MT#1c

7.4.5.1 (MT#1c) Mobile termination, roaming, without I-CSCF in home network providing configuration independence, terminating UE is busy, and not able or not willing to answer the call (MO#2, S-S#2 assumed)

Figure 7.4.5.1 shows a termination procedure which applies to roaming subscribers when the home network operator does not desire to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates the S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.

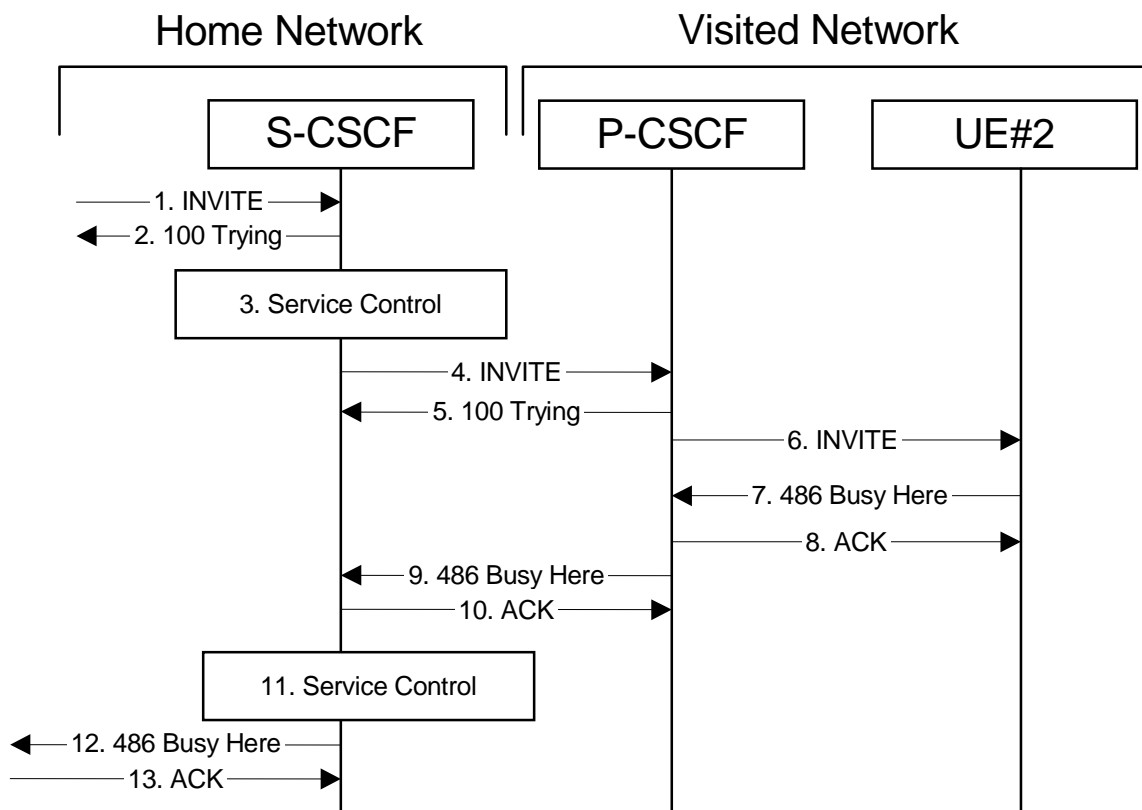


Figure 7.4.5.1-1: MT#1c

Procedure MT#1c is as follows:

1. INVITE (S-S to MT#1a) – see example in table 7.4.5.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 7.4.5.1-1: INVITE (S-S to MT#1c)

```
INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported: 100rel
```

```

Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
  seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (MT#1c to S-S) – see example in table 7.4.5.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.5.1-2: 100 Trying (MT#1c to S-S)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
  SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

4. INVITE (S-CSCF to P-CSCF) – see example in table 7.4.5.1-4

S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF.

Table 7.4.5.1-4: INVITE (S-CSCF to P-CSCF)

```

INVITE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
  SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
  SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
  sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

```

```
v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

P-Called-Party-ID: Includes the dialled URL with its parameters

Route: Built from the registration information, (UE contact name), **Via:**, **Record-Route:** S-CSCF adds itself

5. 100 Trying (P-CSCF to S-CSCF) – see example in table 7.4.5.1-5

P-CSCF responds to the INVITE request (4) with a 100 Trying provisional response.

Table 7.4.5.1-5: 100 Trying (P-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. INVITE (P-CSCF to UE) – see example in table 7.4.5.1-6

The P-CSCF extract the UE address from the Route header value and place it into the Request-URI,, and forwards the INVITE request to the UE.

Table 7.4.5.1-6: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```
Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
sip:, sip:431h23.1@pcscf1.home1.net
```

- Contact:** A locally unique token to identify the saved routing information.
- Via:** P-CSCF removes the Via headers, and generates a locally unique token to identify the saves values. It inserts this as a branch value on its Via header.
- Media-Authorization:** A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

7. 486 Busy Here (UE to P-CSCF) – see example in table 7.4.5.1-7

UE is contacted successfully but it is currently not willing or able to take additional sessions. The response MAY indicate a better time later to call in the Retry-After header.

Table 7.4.5.1-7: 486 Busy Here (UE to P-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

- Retry-After:** A time period in seconds indicating how long the caller can try again.

8. ACK (P-CSCF to UE) – see example in table 7.4.5.1-8

Upon receive the 486 response from the UE, P-CSCF sends ACK back to the UE.

Table 7.4.5.1-8: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

9. 486 Busy Here (P-CSCF to S-CSCF) – see example in table 7.4.5.1-9

P-CSCF forwards the 486 response to the S-CSCF.

Table 7.4.5.1-9: 486 Busy Here (P-CSCF to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=4321
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

10. ACK (S-CSCF to P-CSCF) – see example in table 7.4.5.1-10

S-CSCF sends ACK to the P-CSCF.

Table 7.4.5.1-10: ACK (S-CSCF to P-CSCF)

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

12. 486 Busy Here (MT#1c to S-S) – see example in table 7.4.5.1-12

S-CSCF forwards the 486 Busy Here response to the originator, per the S-CSCF to S-CSCF procedure. Also indicates the voice mail address of the callee.

Table 7.4.5.1-12: 486 Busy Here (MT#1c to S-S)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0

```

13. ACK (S-S to MT#1c) – see example in table 7.4.5.1-13

The S-CSCF of calling party responds to the 486 Busy Here response with an ACK request that is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 7.4.5.1-13: ACK (S-S to MT#1c)

```

ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

7.4.6 MT#2a**7.4.6.1 (MT#2a) Mobile termination, located in home network, terminating UE is busy, and not able or not willing to answer the call (MO#2, S-S#2 assumed)**

Figure 7.4.6.1-1 shows a termination procedure, which applies to subscribers located in their home service area.

The UE is located in the home network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates a S-CSCF in the home network, S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.

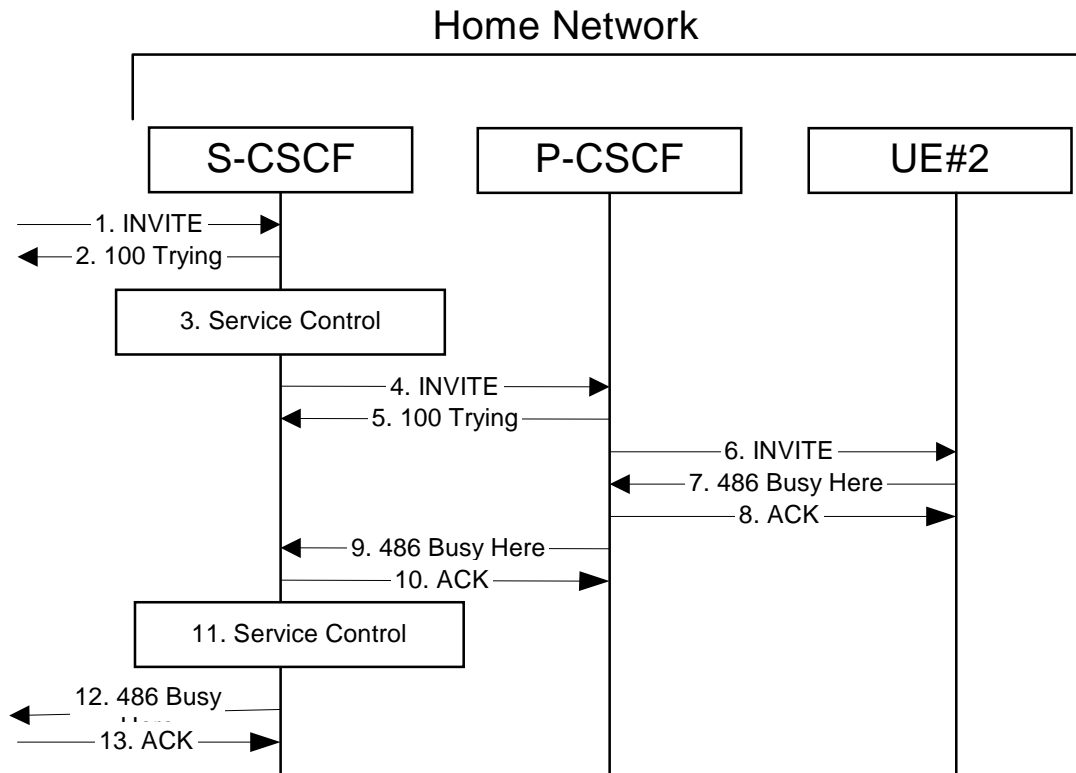


Figure 7.4.6.1-1: MT#2a

Procedure MT#2a is as follows:

1. INVITE (S-S to MT#2a) – see example in table 7.4.6.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 7.4.6.1-1: INVITE (S-S to MT#2A)

```

INVITE sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
    
```

2. 100 Trying (MT#2a to S-S) – see example in table 7.4.6.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.6.1-2: 100 Trying (MT#2A to S-S)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

4. INVITE (S-CSCF to P-CSCF) – see example in table 7.4.6.1-4 (related to table 7.4.6.1-1)

S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

Table 7.4.6.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

Route: Built from the registration information, (pcscf and UE contact name), followed by the initial Request-URI from the incoming INVITE request. The first component of the Route header, pcscf, is moved to the Request-URI of the request.

Via/Record-Route: S-CSCF adds itself in the Record-Route and Via headers.

5. 100 Trying (P-CSCF to S-CSCF) – see example in table 7.4.6.1-5

P-CSCF responds to the INVITE request (4) with a 100 Trying provisional response.

Table 7.4.6.1-5: 100 Trying (P-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. INVITE (P-CSCF to UE) – see example in table 7.4.6.1-6 (related to table 7.4.6.1-4)

P-CSCF determines the UE address from the value of the Request-URI (which was previously returned by P-CSCF as a contact header value in the registration procedure), and forwards the INVITE request to the UE.

Table 7.4.6.1-6: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=39z58a.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Content-Type:
Contact:
P-Called-Party-ID:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```
Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

7. 486 Busy Here (UE to P-CSCF) – see example in table 7.4.6.1-7

UE is contacted successfully but it is currently not willing or able to take additional sessions. The response MAY indicate a better time to call in the Retry-After header.

Table 7.4.6.1-7: 486 Busy Here (UE to P-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf2.home1.net;branch=39z58a.1
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID:
CSeq:
Retry-After: 3600
Content-Length: 0
```

8. ACK (P-CSCF to UE) – see example in table 7.4.6.1-8

Upon receive the 486 response from the UE, P-CSCF sends ACK back to the UE.

Table 7.4.6.1-8: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=39z58a.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

9. 486 Busy Here (P-CSCF to S-CSCF) – see example in table 7.4.6.1-9 (related to table 7.4.6.1-7)

P-CSCF forwards the 486 response to the S-CSCF.

Table 7.4.6.1-9: 486 Busy Here (P-CSCF to S-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

10. ACK (S-CSCF to P-CSCF) – see example in table 7.4.6.1-10

S-CSCF sends ACK to the P-CSCF.

Table 7.4.6.1-10: ACK (S-CSCF to P-CSCF)

```
ACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

11. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

12. 486 Busy Here (MT#2a to S-S) – see example in table 7.4.6.1-12

S-CSCF forwards the 486 BusyHere response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.6.1-12: 486 Busy Here (MT#2a to S-S)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

13. ACK (S-S to MT#2a) – see example in table 7.4.6.1-13

The S-CSCF of calling party responds to the 486 Busy Here response with an ACK request that is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 7.4.6.1-13: ACK (S-S to MT#1c)

```
ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

7.4.7 MT#1e

7.4.7.1 (MT#1e) Mobile termination, roaming, without I-CSCF in home network providing configuration independence, service is refused by S-CSCF when receiving INVITE request (MO#2, S-S#2 assumed)

Figure 7.4.7.1-1 shows a termination procedure, which applies to roaming subscribers when the home network operator does not desire to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates the S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.

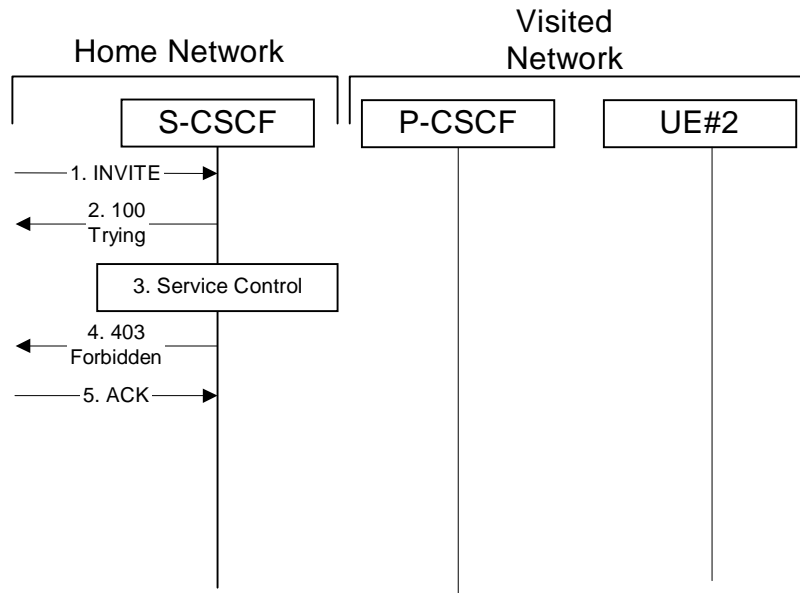


Figure 7.4.7.1-1: Mobile termination, roaming, without I-CSCF in home network providing configuration independence, service is refused by S-CSCF when receiving INVITE request

1. INVITE (S-S to MT#1e) - see example in table 7.4.7.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 7.4.7.1-1: INVITE (S-S to MT#1e)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555:aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (MT#1e to S-S) - see example in table 7.4.7.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.7.1-2: 100 Trying (MT#1e to S-S)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

4. 403 Forbidden (MT#1e to S-S) - see example in table 7.4.7.1-4

S-CSCF forwards the 403 Forbidden response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.4.7.1-4: 403 Forbidden (MT#1e to S-S)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=1234
Call-ID:
CSeq:
Content-Length: 0
```

5. ACK (S-S to MT#1e) - see example in table 7.4.7.1-5

The S-CSCF of calling party responds to the 403 Forbidden response with an ACK request that is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 7.4.7.1-5: ACK (S-S to MT#1e)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: sip:+1-212-555-2222@home2.net;user=phone
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

7.4.8 Mobile termination, roaming, terminal is out of radio coverage (MO#2, S-S#2 assumed)

Editor's Note: currently in annex

7.4.9 Mobile termination, unregistered subscriber**7.4.9.1 Introduction**

In the example information flows in the following sections, the subscriber receiving a terminating call is unregistered. Therefore, when the I-CSCF in the home network of the called subscriber queries the HSS for the location of the called subscriber, the HSS indicates that the subscriber is unregistered.

In subclause 7.4.9.2, call setup does not proceed, as the subscriber does not have services related to unregistered state.

In subclause 7.4.9.3, call setup proceeds and a temporary call instance is created at the callee's S-CSCF for the life of the call. This is to support services related to the unregistered state of the callee.

7.4.9.2 Mobile termination, unregistered subscriber, no services related to unregistered state

In the example information flow the subscriber is unregistered and the subscriber has no services related to unregistered state. This is shown in the following information flow (figure 7.4.9.2-1).

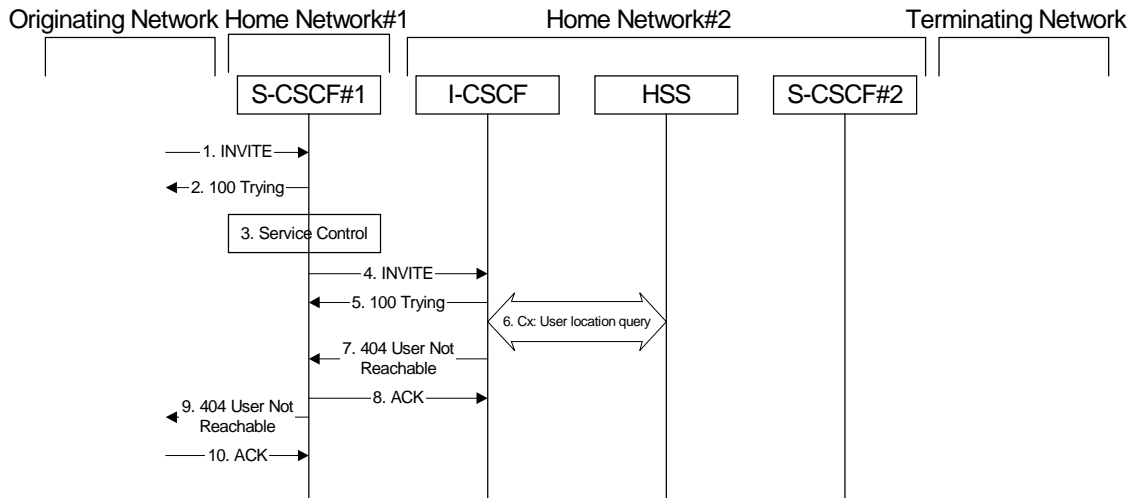


Figure 7.4.9.2-1: Mobile termination, unregistered subscriber

1. INVITE (MO to S-S#1a) – see example in table 7.4.9.2-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.4.9.2-1: INVITE (MO to S-S#1a)

```

INVITE sip:scscf1.homel.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@homel.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1a to MO) – see example in table 7.4.9.2-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.9.2-2: 100 Trying (S-S#1a to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 7.4.9.2-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator does not desire to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request directly to I-CSCF in the destination network.

Table 7.4.9.2-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

5. 100 Trying (I-CSCF to S-CSCF) – see example in table 7.4.9.2-5

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 7.4.9.2-5: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the information that the subscriber is not currently registered and it does not have any service when the user is unregistered.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2.1-6a provides the parameters in the SIP INVITE request (flow 4), which are sent to the HSS.

7. 404 User Not Reachable (I-CSCF to S-CSCF) – see example in table 7.4.9.2-7

I-CSCF initiates a 404 User Not Reachable response to S-CSCF#1.

Editor's Note: It is FFS to decide whether 404 User Not Reachable is the best response code to send.

Table 7.4.9.2-7: 404 User Not Reachable (I-CSCF to S-CSCF)

```
SIP/2.0 404 User Not Reachable
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. ACK (S-CSCF to I-CSCF) – see example in table 7.4.9.2-8

S-CSCF#1 responds to the I-CSCF with ACK.

Table 7.4.9.2-8: ACK (S-CSCF to I-CSCF)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

9. 404 User Not Reachable (S-S#1a to MO) – see example in table 7.4.9.2-9

S-CSCF#1 forwards the 404 User Not Reachable to the originator, as per the originating procedure.

Table 7.4.9.2-9: 404 User Not Reachable (S-S#1a to MO)

```
SIP/2.0 404 User Not Reachable
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. ACK (MO to S-S#1a) – see example in table 7.4.9.2-10

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 7.4.9.2-10: ACK (MO to S-S#1a)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0
```

7.4.9.3 Mobile termination, unregistered subscriber, services related to unregistered state

In the example information flow the subscriber is unregistered and the subscriber has services related to unregistered state. This is shown in the following information flow (figure 7.4.9.3-1).

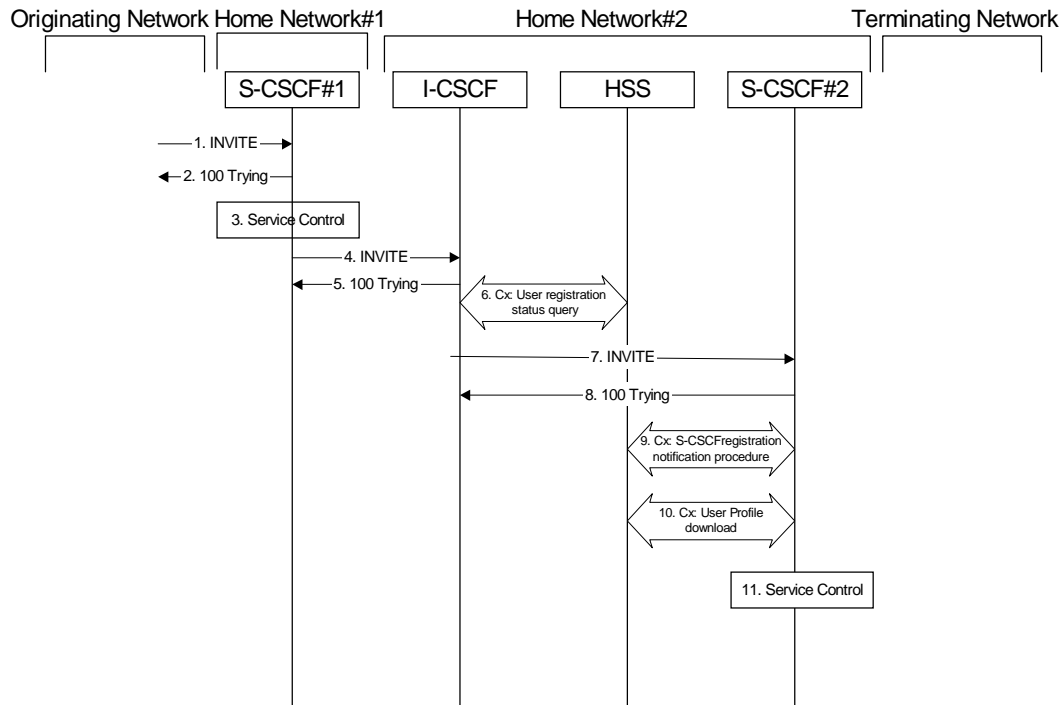


Figure 7.4.9.3-1: Mobile termination, unregistered subscriber with services

1. INVITE (MO to S-S#1a) – see example in table 7.4.9.3-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 7.4.9.3-1: INVITE (MO to S-S#1a)

```

INVITE sip:scscf1.homel.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@homel.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1a to MO) – see example in table 7.4.9.3-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.4.9.3-2: 100 Trying (S-S#1a to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

4. INVITE (S-CSCF to I-CSCF) – see example in table 7.4.9.3-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator does not desire to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request directly to I-CSCF in the destination network.

Table 7.4.9.3-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

5. 100 Trying (I-CSCF to S-CSCF) – see example in table 7.4.9.3-5

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 7.4.9.3-5: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. Cx: User Registration Status Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the information that the user is not currently registered, but the user has services when the user is not registered.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2.1-6a provides the parameters in the SIP INVITE request (flow 4), which are sent to the HSS.

Based on the CX response the I-CSCF selects an appropriate S-CSCF.

7. INVITE (I-CSCF to S-CSCF) – see example in table 7.4.9.3-7

Table 7.4.9.3-7: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

8. 100 Trying (I-CSCF to S-CSCF) – see example in table 7.4.9.3-8

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 7.4.9.3-8: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

9. Cx: S-CSCF registration notification procedure

The S-CSCF sends a query to the HSS to record the S-CSCF of the called user.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-7a provides the parameters in the INVITE request (flow 7) which are sent to the HSS

Editor's Note: It needs to be checked whether all the input information in table 6.2-8 is available in the INVITE. For instance, the private user identity may not be available in the INVITE.

10. Cx: User Profile Download procedure

The S-CSCF sends a query to the HSS to determine the subscriber profile of the callee. The HSS responds with the profile.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-9a provides the parameters in the SIP INVITE request (flow 7), which are sent to the HSS.

11. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt.

12. Successful session setup continues (not shown in the flow)

The rest of the terminating session is setup as described in subclause 7.4.2 with the INVITE being transmitted from the S-CSCF#2 to the appropriate network entity (e.g. the INVITE may be forwarded to an application server).

7.5 Sample multimedia signalling flows: addition of further media streams

7.5.1 Introduction

None.

7.5.2 Sample multimedia signalling flow - addition of further media - originator and terminator are both roaming and operated by different networks

Figure 7.5.2-1 shows a multimedia signalling flow for the addition of another media where the originator and terminator are both roaming and operated by different networks. Both networks are without I-CSCF providing configuration independence. The UE has already established an IM session carrying voice and is generating an INVITE request to add video media to the already established IM session.

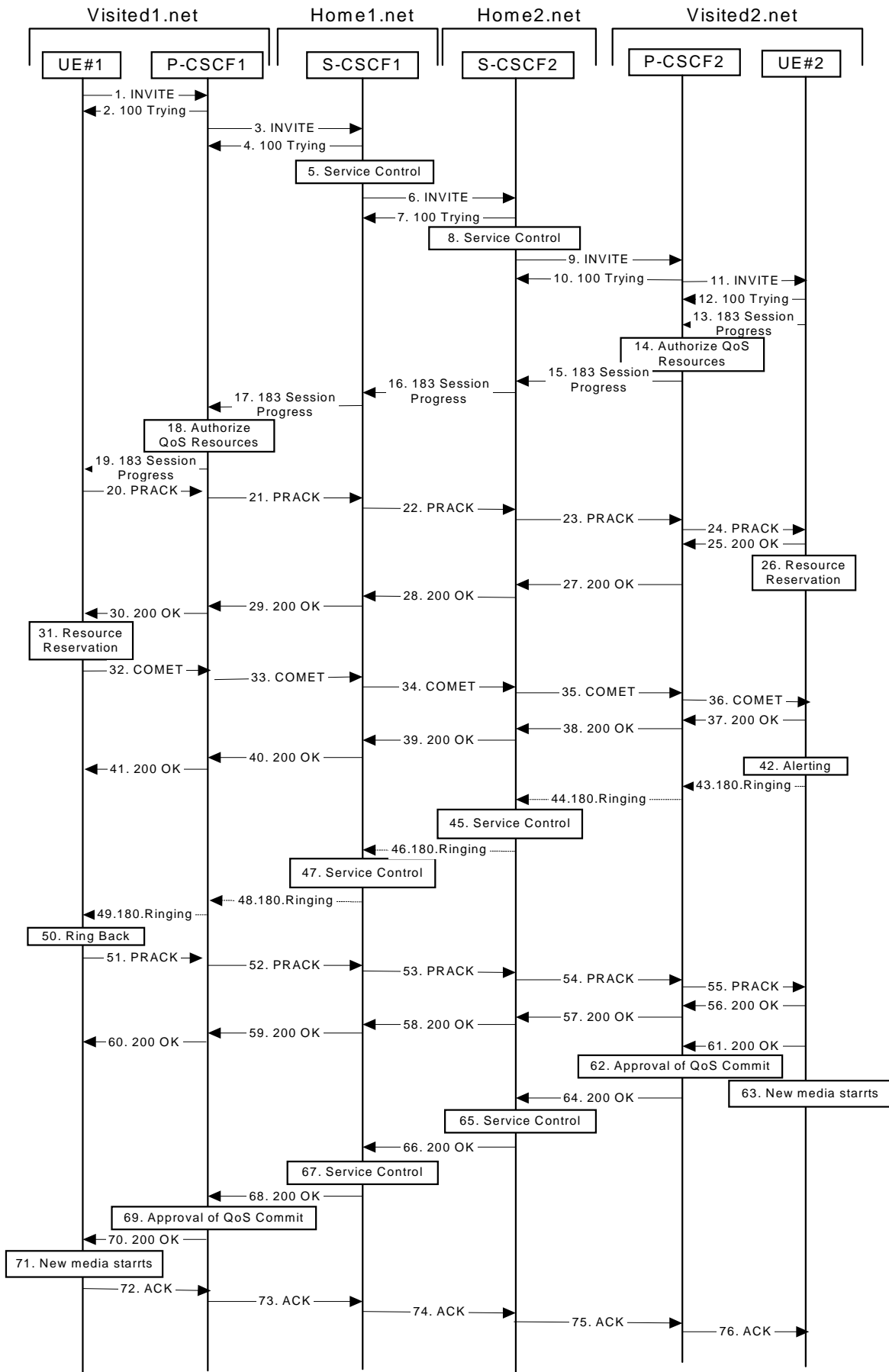


Figure 7.5.2-1: Sample multimedia signalling flow - addition of further media

1. INVITE (UE1 to P-CSCF1) – see example in table 7.5.2-1

UE#1 sends a SIP INVITE request, containing new SDP for the new video media and including the original SDP, to P-CSCF1, which is pcscf1.visited1.net in its visited network.

Table 7.5.2-1 INVITE (UE1 to P-CSCF1)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-
    1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 132 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907166275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv

```

Request-URI:	Contains the keyed number from the user.
Via:	Contains the IP address or FQDN of the originating UE.
Remote-Party-ID:	Contains the public user identity. The Display name is optional.
From:/To:/Call-ID:	Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
Cseq:	Is a random starting number.
Contact:	Is the SIP URL that contains the IP address or FQDN of the originating UE.

2. 100 Trying (P-CSCF1 to UE1) - see example in table 7.5.2-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 7.5.2-2: 100 Trying (P-CSCF1 to UE1)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. INVITE (P-CSCF1 to S-CSCF1) - see example in table 7.5.2-3

The INVITE request is sent by the P-CSCF to the next hop scscf1.home1.net, which is in UE's home network. Because this a re-invite, so the I-CSCF1 is not involved in sip transaction.

Table 7.5.2-3: INVITE (P-CSCF1 to S-CSCF1)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

Route: P-CSCF knows the request routing from the previous sip transactions.

Request-URI: The first component in the remembered Path header from Registration.

4. 100 Trying (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-4

S-CSCF sends the 100 Trying provisional response to P-CSCF.

Table 7.5.2-4: 100 Trying (S-CSCF1 to P-CSCF1)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

5. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

6. INVITE (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-6

S-CSCF1 sends the INVITE request to UE's serving CSCF-cscf2.home2.net, which is in the callee (UE2)'s home network. Because this is a re-invite, so the I-CSCF2 is not involved in the sip transaction.

Table 7.5.2-6: INVITE (S-CSCF1 to S-CSCF2)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

7. 100 Trying (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-7

S-CSCF1 receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 7.5.2-7: 100 Trying (S-CSCF2 to S-CSCF1)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. Service Control

S-CSCF2 validates the service profile, and performs any origination service control required for this subscriber.

S-CSCF#2 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

9. INVITE (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-9

S-CSCF2 forwards the INVITE request to callee's P-CSCF pcscf2.visited2.net which is in the UE2's visited network, called visited2.net

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 7.5.2-9: INVITE (S-CSCF2 to P-CSCF2)

```

INVITE sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

10. 100 Trying (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-10

P-CSCF sends a 100 Trying provisional response back to S-CSCF2.

Table 7.5.2-10: 100 Trying (P-CSCF2 to S-CSCF2)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. INVITE (P-CSCF2 to UE2) - see example in table 7.5.2-11

P-CSCF determines the UE address from the value of the Request-URI, and forwards the INVITE request to the UE.

Table 7.5.2-11: INVITE (P-CSCF2 to UE2)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363233
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14623".

12. 100 Trying (UE2 to P-CSCF2) - see example in table 7.5.2-12

P-CSCF receives a 100 Trying provisional response back to S-CSCF2.

Table 7.5.2-12: 100 Trying (UE2 to P-CSCF2)

```

SIP/2.0 100 Trying
Via: pcscf2.visited2.net;branch=token2 SIP/2.0/UDP,
From:
To:
Call-ID:
CSeq:

```

13. 183 Session Progress (UE2 to P-CSCF2) - see example in table 7.5.2-13

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response.

Table 7.5.2-13: 183 Session Progress response (UE2 to P-CSCF2)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907166275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=video 7544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv confirm

```

14. Authorize QoS Resources

P-CSCF2 authorizes the resources necessary for this new media.

15. 183 Session Progress (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-15

P-CSCF2 forwards the 183 Session Progress response to S-CSCF2.

Table 7.5.2-15: 183 Session Progress (P-CSCF2 to S-CSCF2)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

16. 183 Session Progress (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-16

S-CSCF2 forwards the 183 Session Progress response to caller's S-CSCF.

Table 7.5.2-16: 183 Session Progress (S-CSCF2 to S-CSCF1)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

17. 183 Session Progress (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-17

S-CSCF1 forwards the 183 Session Progress response to the caller's P-CSCF.

Table 7.5.2-17: 183 Session Progress (S-CSCF1 to P-CSCF1)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

18. Authorize QoS Resources

P-CSCF1 authorizes the resources necessary for this new media.

19. 183 Session Progress (P-CSCF1 to UE1) - see example in table 7.5.2-19

P-CSCF forwards the 183 Session Progress response to the originating endpoint.

Table 7.5.2-19: 183 Session Progress (P-CSCF1 to UE1)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373400
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3074".

20. PRACK (UE1 to P-CSCF1) - see example in table 7.5.2-20

The originating endpoint sends a PRACK request containing the final SDP to be used in this session to it's P-CSCF.

Table 7.5.2-20: PRACK (UE1 to P-CSCF1)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 133 PRACK
Rack: 9022 132 INVITE
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=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv

```

21. PRACK (P-CSCF1 to S-CSCF1) - see example in table 7.5.2-21

P-CSCF adds a Route header, with the saved value from the previous response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF1 forwards the PRACK request to S-CSCF1.

Table 7.5.2-21: PRACK (P-CSCF1 to S-CSCF1)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length: (...)

v=0
o=-
s=-
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

22. PRACK (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-22

S-CSCF1 forwards the PRACK request to S-CSCF2.

Table 7.5.2-22: PRACK (S-CSCF1 to S-CSCF2)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length: (...)

v=0
o=-
s=-
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

23. PRACK (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-23

S-CSCF2 forwards the PRACK request to P-CSCF2.

Table 7.5.2-23: PRACK (S-CSCF2 to P-CSCF2)

```

PRACK sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

24. PRACK (P-CSCF2 to UE2) - see example in table 7.5.2-24

P-CSCF2 forwards the PRACK request to callee UE2.

Table 7.5.2-24: PRACK (P-CSCF2 to UE2)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token4
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

25. 200 OK (UE2 to P-CSCF2) - see example in table 7.5.2-25

UE acknowledges the PRACK request with a 200 OK response.

Table 7.5.2-25: 200 OK (UE2 to P-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token4
From:
To:
Call-ID:
CSeq: 133 Rack
Content-Length: 0

```

26. Resource Reservation

UE2 initiates the reservation procedures for the new media.

27. 200 OK (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-27

P-CSCF forwards the 200 OK response to S-CSCF.

Table 7.5.2-27: 200 OK (P-CSCF2 to S-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

28. 200 OK (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-28

S-CSCF2 forwards the 200 OK response to the originator's S-CSCF, scscf1.home1.net.

Table 7.5.2-28: 200 OK (S-CSCF2 to S-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

29. 200 OK (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-29

S-CSCF1 forwards the 200 OK response to the originator's P-CSCF1.

Table 7.5.2-29: 200 OK (S-CSCF1 to P-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

30. 200 OK (P-CSCF1 to UE1) - see example in table 7.5.2-30

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.5.2-30: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

31. Resource Reservation

UE1 initiates the reservation procedures for the new media.

32. COMET (UE1 to P-CSCF1) - see example in table 7.5.2-32

When the resource reservation is completed, UE sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The request is sent first to P-CSCF.

Table 7.5.2-32: COMET (UE1 to P-CSCF1)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 134 COMET
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=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:success sendonly

```

33. COMET (P-CSCF1 to S-CSCF1) - see example in table 7.5.2-33

P-CSCF1 forwards the COMET request to S-CSCF1.

Table 7.5.2-33: COMET (P-CSCF1 to S-CSCF1)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length: (...)

v=0
o=-
s=-
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

34. COMET (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-34

S-CSCF1 forwards the COMET request to S-CSCF2.

Table 7.5.2-34: COMET (S-CSCF1 to S-CSCF2)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length: (...)

v=0
o=-
s=-
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

35. COMET (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-35

S-CSCF2 forwards the COMET request to P-CSCF2.

Table 7.5.2-35: COMET (S-CSCF2 to P-CSCF2)

```

COMET sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

36. COMET (P-CSCF2 to UE2) - see example in table 7.5.2-36

P-CSCF forwards the COMET request to UE2.

Table 7.5.2-36: COMET (P-CSCF2 to UE2)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token5
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

37. 200 OK (UE2 to P-CSCF2) - see example in table 7.5.2-37

UE acknowledges the COMET request with a 200 OK response.

Table 7.5.2-37: 200 OK (UE2 to P-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token5
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

38. 200 OK (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-38

P-CSCF2 forwards the 200 OK response to S-CSCF2.

Table 7.5.2-38: 200 OK (P-CSCF2 to S-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

39. 200 OK (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-39

S-CSCF2 forwards the 200 OK response to the originator's serving CSCF.

Table 7.5.2-39: 200 OK (S-CSCF2 to S-CSCF1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

40. 200 OK (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-40

S-CSCF1 forwards the 200 OK response to the P-CSCF1.

Table 7.5.2-40: 200 OK (S-CSCF1 to P-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

41. 200 OK (P-CSCF1 to UE1) - see example in table 7.5.2-41

P-CSCF1 forwards the 200 OK response to UE1.

Table 7.5.2-41: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

42. Alerting

UE#2 may optionally delay the session establishment in order to alert the subscriber to the incoming additional media.

43. 180 Ringing (UE2 to P-CSCF2) – see example in table 7.5.2-43

Before proceeding with session establishment, the UE waits for two events. First, the resource reservation initiated in step #26 must complete successfully. Second, the resource reservation initiated by the originating endpoint must complete successfully (which is indicated by message #31 received by UE). The UE may now immediately accept the session or alert the destination subscriber of an incoming session attempt; if the latter it indicates this to the calling party by a 180 Ringing provisional response sent to P-CSCF.

Table 7.5.2-43: 180 Ringing (UE2 to P-CSCF2)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9023
Content-Length: 0
```

44. 180 Ringing (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-44

P-CSCF2 forwards the 180 Ringing response to S-CSCF2.

Table 7.5.2-44: 180 Ringing (P-CSCF2 to S-CSCF2)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

45. Service Control

S-CSCF2 performs whatever service control is appropriate for this ringing.

46. 180 Ringing (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-46

S-CSCF2 forwards the 180 Ringing response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.5.2-46: 180 Ringing (S-CSCF2 to S-CSCF1)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

47. Service Control

S-CSCF1 performs whatever service control is appropriate for this ringing.

48. 180 Ringing (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-48

S-CSCF1 forwards the 180 Ringing response to the P-CSCF1.

Table 7.5.2-48: 180 Ringing (S-CSCF1 to P-CSCF1)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

49. 180 Ringing (P-CSCF1 to UE1) - see example in table 7.5.2-49

P-CSCF1 forwards the 180 Ringing response to the UE1.

Table 7.5.2-49: 180 Ringing (P-CSCF1 to UE1)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

50. Ringback

UE1 indicates to the originator that the media addition is being delayed due to alerting. Typically this involves playing a ringback sequence.

51. PRACK (UE1 to P-CSCF1) - see example in table 7.5.2-51

The originating endpoint sends a PRACK request for the Ringing response to the terminator.

Table 7.5.2-51: PRACK (UE1 to P-CSCF1)

```
PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 135 PRACK
Rack: 9023 132 INVITE
Content-Length: 0
```

52. PRACK (P-CSCF1 to S-CSCF1) - see example in table 7.5.2-52

P-CSCF adds a Route header, with the saved value from the previous response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF1 forwards the PRACK request to S-CSCF1.

Table 7.5.2-52: PRACK (P-CSCF1 to S-CSCF1)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

53. PRACK (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-53

S-CSCF1 forwards the PRACK request to S-CSCF2.

Table 7.5.2-53: PRACK (S-CSCF1 to S-CSCF2)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length: 0
```

54. PRACK (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-54

S-CSCF2 forwards the PRACK request to P-CSCF2.

Table 7.5.2-54: PRACK (S-CSCF2 to P-CSCF2)

```
PRACK sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

55. PRACK (P-CSCF2 to UE2) - see example in table 7.5.2-55

P-CSCF2 forwards the PRACK request to callee UE2.

Table 7.5.2-55: PRACK (P-CSCF2 to UE2)

```
PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token7
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

56. 200 OK (UE2 to P-CSCF2) - see example in table 7.5.2-56

UE2 acknowledges the PRACK request with a 200 OK response.

Table 7.5.2-56: 200 OK (UE2 to P-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

57. 200 OK (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-57

P-CSCF2 forwards the 200 OK response to S-CSCF2.

Table 7.5.2-57: 200 OK (P-CSCF2 to S-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

58. 200 OK (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-58

S-CSCF2 forwards the 200 OK response to the originator's serving CSCF.

Table 7.5.2-58: 200 OK (S-CSCF2 to S-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

59. 200 OK (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-59

S-CSCF1 forwards the 200 OK response to the P-CSCF1.

Table 7.5.2-59: 200 OK (S-CSCF1 to P-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

60. 200 OK (P-CSCF1 to UE1) - see example in table 7.5.2-60

P-CSCF1 forwards the 200 OK response to UE1.

Table 7.5.2-60: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

61. 200 OK (UE2 to P-CSCF2) - see example in table 7.5.2-61

UE acknowledges the Invite request with a 200 OK response.

Table 7.5.2-61: 200 OK (UE2 to P-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
From:
To:
Call-ID:
CSeq: 132 Invite
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907166275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=video 7544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:success sendrecv
```

62. Approval of QoS Commit

P-CSCF2 approves the commitment of the QoS resources for this additional media

63. New media can start here

64. 200 OK (P-CSCF2 to S-CSCF2) - see example in table 7.5.2-64

P-CSCF2 forwards the 200 OK response to S-CSCF2.

Table 7.5.2-64: 200 OK (P-CSCF2 to S-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

65. Service Control

S-CSCF2 performs whatever service control is required for the session completion.

66. 200 OK (S-CSCF2 to S-CSCF1) - see example in table 7.5.2-66

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 7.5.2-66: 200 OK (S-CSCF2 to S-CSCF1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

67. Service Control

S-CSCF1 performs whatever service control is required for the session completion.

68. 200 OK (S-CSCF1 to P-CSCF1) - see example in table 7.5.2-68

S-CSCF1 forwards the 200 OK response to the P-CSCF1.

Table 7.5.2-68: 200 OK (S-CSCF1 to P-CSCF1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

69. Approval of QoS Commit

P-CSCF1 approves the commitment of the QoS resources for this additional media.

70. 200 OK (P-CSCF1 to UE1) - see example in table 7.5.2-70

P-CSCF1 forwards the 200 OK response to the UE1.

Table 7.5.2-70: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:
```

```
v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

71. New media can start here

72. ACK (UE1 to P-CSCF1) - see example in table 7.5.2-72

UE1 forwards the ACK request to P-CSCF1.

Table 7.5.2-72: ACK (UE1 to P-CSCF1)

```
ACK sip:token9@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 132 ACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: (...)
```

73. ACK (P-CSCF1 to S-CSCF1) - see example in table 7.5.2-73

P-CSCF1 adds a Route header, with the saved value from the previous response. P-CSCF1 identifies the proper saved value by the Request-URI.

P-CSCF1 forwards the ACK request to S-CSCF1.

Table 7.5.2-73: ACK (P-CSCF1 to S-CSCF1)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length: (...)
```

74. ACK (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-74

S-CSCF1 forwards the ACK request to S-CSCF2.

Table 7.5.2-74: ACK (S-CSCF1 to S-CSCF2)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1 SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length: (...)

```

75. ACK (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-75

S-CSCF2 forwards the ACK request to P-CSCF2.

Table 7.5.2-75: ACK (S-CSCF2 to P-CSCF2)

```

ACK sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

76. ACK (P-CSCF2 to UE2) - see example in table 7.5.2-76

P-CSCF forwards the ACK request to UE2.

Table 7.5.2-76: ACK (P-CSCF2 to UE2)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token5
From:
To:
Call-ID:
Cseq:
Content-Length:

```

7.6 Error handling: session initiation (not provided)

An example of this flow is not shown in the present document.

8 Signalling flows for session release (non hiding)

8.1 Introduction

Void.

8.2 Mobile terminal initiated session release

Figure 8.2-1 shows a mobile terminal initiated IM CN subsystem application (SIP) session release. It is assumed that the session is active and that the bearer was established directly between the two visited networks (the visited networks could be the Home network in either or both cases).

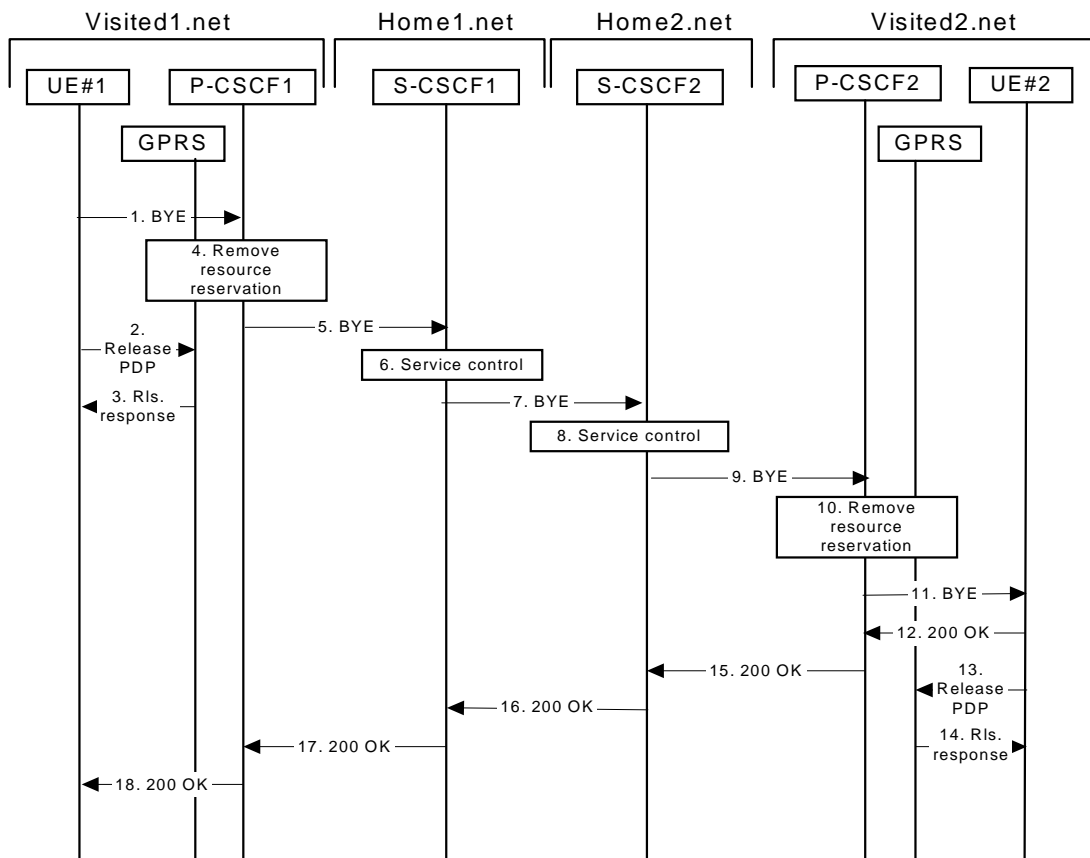


Figure 8.2-1: Mobile initiated session release

1 SIP BYE (UE to P-CSCF) - see example in table 8.2-1

One mobile party hangs up, which generates a SIP BYE request from the UE to the P-CSCF.

Table 8.2-1: SIP BYE (UE to P-CSCF)

```

BYE sip:token10@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 153 BYE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0
    
```

The request-URI takes the value of the Contact header of the previously received response.

The Via header and the contact header take the value of either the IP address or the FQDN of the originating UE.

The example contents of the From header, the To header and Call-ID header are used to identify the session being cleared, and therefore are identical to those of the previously received response for that session, so that they include any tag parameters.

The content of the Cseq header must have a higher sequence number than the previous transaction. Here it is assumed that a Cseq value no greater than 152 has been previously used.

2 Release PDP

Steps 2 and 3 may take place before or after Step 1 and in parallel with Step 4. The UE initiates the release of the bearer PDP context. The GPRS subsystem releases the PDP context. The IP network resources that had been reserved for the message receive path to the mobile for this session are now released. This is initiated from the GGSN. If RSVP was used to allocated resources, then the appropriate release messages for that protocol would be invoked here.

3 Rls. Response

The GPRS subsystem responds to the UE.

4 Remove resource reservation

The P-CSCF removes the authorization for resources that had previously been issued for this endpoint for this session. This step will also result in a release indication to the GPRS subsystem to confirm that the IP bearers associated with the session have been deleted.

5 SIP BYE (P-CSCF to S-CSCF) - see example in table 8.2-5

The P-CSCF sends a SIP BYE request to the S-CSCF of the releasing party.

Table 8.2-5: SIP BYE (P-CSCF to S-CSCF)

```
BYE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0
```

6 Service control

The S-CSCF performs whatever service control procedures are appropriate for this ending session.

7 SIP BYE (S-CSCF to S-CSCF) see example in table 8.2-7

The SIP BYE request is sent from the S-CSCF to the S-CSCF of the network of the other party.

Table 8.2-7: SIP BYE (S-CSCF to S-CSCF)

```
BYE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

8 Service control

The S-CSCF performs whatever service control procedures are appropriate for this ending session.

9 SIP BYE (S-CSCF to P-CSCF) - see example in table 8.2-9

The SIP BYE request is forwarded directly to the P-CSCF.

Table 8.2-9: SIP BYE (S-CSCF to P-CSCF)

```

BYE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

10 Remove resource reservation

The P-CSCF removes the authorisation for resources that had previously been issued for this endpoint for this session. This step also results in a release indication to the GPRS subsystem to confirm that the IP bearers associated with the UE#2 session have been deleted.

11 SIP BYE (P-CSCF to UE) - see example in table 8.2-11

The P-CSCF forwards the SIP BYE request on to the UE.

Table 8.2-11: SIP BYE (P-CSCF to UE)

```

BYE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token25
From:
To:
Call-ID:
CSeq:
Contact: token25@pcscf2.visited2.net
Content-Length: 0

```

12 200 OK (UE to P-CSCF) - see example in table 8.2-12

The mobile responds with a 200 OK response, which is sent back to the P-CSCF.

Table 8.2-12: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token25
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

13 Release PDP

Steps 14 and 15 may be done in parallel with step 13. The Mobile initiates the release of the bearer PDP context.

14 RIs response

The GPRS subsystem releases the PDP context. The IP network resources that had were reserved for the message receive path to the mobile for this session are now released. This is initiated from the GGSN. If RSVP was used to allocated resources, then the appropriate release messages for that protocol would invoked here.

15 200 OK (P-CSCF to S-CSCF) - see example in table 8.2-15

The P-CSCF sends a 200 OK response to the S-CSCF directly.

Table 8.2-15: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

16 200 OK (S-CSCF to S-CSCF) - see example in table 8.2-16

The S-CSCF of the other party forwards the 200 OK response to its local S-CSCF.

Table 8.2-16: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

17 200 OK (S-CSCF to P-CSCF) - see example in table 8.2-17

The S-CSCF of the releasing party forwards the 200 OK response to the P-CSCF of the releasing party. The example contents of the 200 OK response are shown in table 9-9.

Table 8.2-17: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

18 200 OK (P-CSCF to UE) - see example in table 8.2-18

The P-CSCF of the releasing party forwards the 200 OK response to the UE.

Table 8.2-18: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8.3 PSTN initiated session release (not provided)

An example of this flow is not shown in the present document.

8.4 Error handling: session release (not provided)

An example of this flow is not shown in the present document.

9 Network initiated procedures (non hiding)

An example of this flow is not shown in the present document.

10 Procedures to enable enhanced multimedia services (non hiding)

10.1 Session hold and resume procedures

10.1.1 Introduction

This subclause gives signalling flows for the procedures for placing sessions on hold that were previously established by the mechanisms of clause 8, and resuming the session afterwards. Two cases are presented: mobile-to-mobile (UE-UE), and a UE-initiated hold of a UE-PSTN session.

For a multimedia session, it is possible to place a subset of the media streams on hold while maintaining the others.

10.1.2 Mobile-to-mobile session hold and resume procedures

An IM session was previously established between an initiating UE and a terminating UE. Each of these UEs has an associated P-CSCF in the same network where they are currently located (either home or roaming), and a S-CSCF assigned in their home network. These functional elements co-operate to clear the session, and the procedures are independent of whether they are located in the home or visited networks.

The hold and resume procedures are identical whether the UE that initiated the session also initiates the session-hold, or whether the UE that terminated the session initiates the session-hold.

When a media stream has been placed on hold, it shall not be resumed by any endpoint other than the one that placed it on hold.

These procedures show only one combination of Mobile-Originated, Serving-to-Serving, and Mobile-Terminated procedures, MO#2, S-S#2, and MT#2. These procedures do not show the use of optional I-CSCFs. If an I-CSCF was included in the signalling path during the session establishment procedure, it would continue to be used in any subsequent signalling flows such as the ones described in this clause. Procedures at the I-CSCFs are identical to those described for the BYE, PRACK, and COMET requests and responses described in other clauses.

The procedures for placing a media stream on hold, and later resuming the media stream, are as shown in figure 10.1.2-1:.

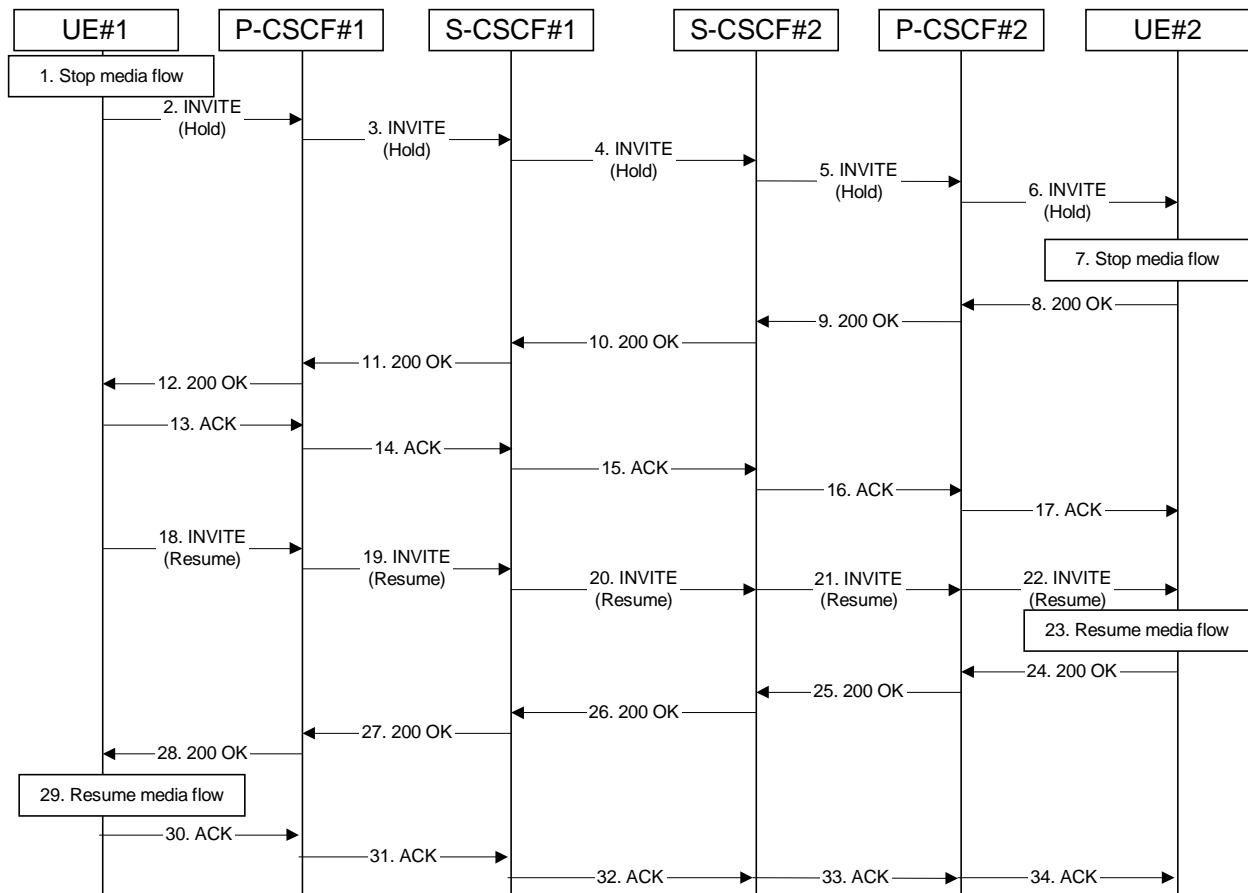


Figure 10.1.2-1: Mobile to mobile session hold and resume

Signalling flow procedures are as follows:

1. Stop Media Flow

UE#1 detects a request from the subscriber to place a media stream on hold. UE#1 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.

2. INVITE(Hold) (UE to P-CSCF) – see example in table 10.1.2-2

UE#1 sends a Hold request to its proxy, P-CSCF#1.

Table 10.1.2-2: INVITE(Hold) (UE to P-CSCF)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933616 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=sendonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2

```

- Request-URI:** Contains the value of the Contact header from the 200-OK response to the initial INVITE.
- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response.
- Cseq:** Next higher sequential value.
- Contact:** Is the SIP URL that contains the IP address or FQDN of the originating UE.
- SDP** The sendrecv media stream is placed on hold by changing it to sendonly media stream, and no media is sent to the far end.

3. INVITE (Hold) (P-CSCF to S-CSCF) – see example in table 10.1.2-3

P-CSCF adds a Route header, with the saved value from the previous 200-OK response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF#1 forwards the Hold request to S-CSCF#1.

Table 10.1.2-3: INVITE(Hold) (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

- Request-URI:** The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

4. INVITE(Hold) (S-CSCF to S-CSCF) – see example in table 10.1.2-4

S-CSCF#1 forwards the Hold request to S-CSCF#2.

Table 10.1.2-4: INVITE(Hold) (S-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

5. INVITE(Hold) (S-CSCF to P-CSCF) – see example in table 10.1.2-5

S-CSCF#2 forwards the Hold request to P-CSCF#2.

Table 10.1.2-5: INVITE(Hold) (S-CSCF to P-CSCF)

```
INVITE sip:pcscf2.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

6. INVITE(Hold) (P-CSCF to UE) – see example in table 10.1.2-6

P-CSCF#2 forwards the Hold request to UE#2.

Table 10.1.2-6: INVITE(Hold) (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

7. Stop Media flow

UE#2 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.

8. 200-OK (UE to P-CSCF) – see example in table 10.1.2-8

UE#2 acknowledges receipt of the Hold request (6) with a 200-OK final response, sent to P-CSCF#2.

Table 10.1.2-8: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933616 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 6402 RTP/AVP 97
b=AS:25.4
a=recvonly
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2

```

SDP: Since the media stream was offered as sendonly, it is marked as recvonly in the response.

9. 200-OK (P-CSCF to S-CSCF) – see example in table 10.1.2-9

P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.

Table 10.1.2-9: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

P-CSCF restores the Via headers and Record-Route headers from the branch value in its Via.

Contact: A locally defined value that identifies the UE.

10. 200-OK (S-CSCF to S-CSCF) – see example in table 10.1.2-10

S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.

Table 10.1.2-10: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

11. 200-OK (S-CSCF to P-CSCF) – see example in table 10.1.2-11

S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.

Table 10.1.2-11: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

12. 200-OK (P-CSCF to UE) – see example in table 10.1.2-12

P-CSCF#1 forwards the 200 OK final response to UE#1.

Table 10.1.2-12: 200 OK (P-CSCF to UE)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information

13. ACK (UE to P-CSCF) – see example in table 10.1.2-13**Table 10.1.2-13: ACK (UE to P-CSCF)**

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 ACK
Content-Length: 0

```

Cseq: Is required to be the same value as Cseq contained in original INVITE request.

14. ACK (P-CSCF to S-CSCF) – see example in table 10.1.2-14**Table 10.1.2-14: ACK (P-CSCF to S-CSCF)**

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:

Content-Length:

```

15. ACK (S-CSCF to S-CSCF) – see example in table 10.1.2-15**Table 10.1.2-15: ACK (S-CSCF to S-CSCF)**

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:

Content-Length:

```

16. ACK (S-CSCF to P-CSCF) – see example in table 10.1.2-16**Table 10.1.2-16: ACK (S-CSCF to P-CSCF)**

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:

Content-Length:

```

17. ACK (P-CSCF to UE) – see example in table 10.1.2-17

S-CSCF forwards the ACK request to the terminating endpoint, per the S-CSCF to S-CSCF procedure.

Table 10.1.2-17: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
Cseq:

Content-Length:

```

18. INVITE(Resume) (Ue to P-CSCF) – see example in table 10.1.2-18

UE#1 detects a request from the subscriber to resume the media stream previously placed on hold. UE#1 sends a Resume request to its proxy, P-CSCF#1.

Table 10.1.2-18: INVITE(Resume) (UE to P-CSCF)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933617 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2

```

- Request-URI:** Contains the value of the Contact header from the 200-OK response to the initial INVITE.
- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response.
- Cseq:** Next higher sequential value.
- Contact:** The IP address or FQDN of the originating UE.
- SDP:** Same SDP as negotiated during the session setup, restores the sendrecv media stream.

19. INVITE(Resume) (P-CSCF to S-CSCF) – see example in table 10.1.2-14

P-CSCF adds a Route header, with the saved value from the previous 200-OK response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF#1 forwards the Resume request to S-CSCF#1.

Table 10.1.2-19: INVITE(Resume) (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

- Request-URI:** The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

20. INVITE(Resume) (S-CSCF to S-CSCF) – see example in table 10.1.2-20

S-CSCF#1 forwards the Resume request to S-CSCF#2.

Table 10.1.2-20: INVITE(Resume) (S-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

21. INVITE(Resume) (S-CSCF to P-CSCF) – see example in table 10.1.2-21

S-CSCF#2 forwards the Resume request to P-CSCF#2.

Table 10.1.2-21: INVITE(Resume) (S-CSCF to P-CSCF)

```
INVITE sip:pcscf2.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

22. INVITE(Resume) (P-CSCF to UE) – see example in table 10.1.2-22

P-CSCF#2 forwards the Resume request to UE#2.

Table 10.1.2-22: INVITE(Resume) (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

23. Resume media flow

UE#2 resumes sending the media stream to the remote endpoint.

24. 200-OK (UE to P-CSCF) – see example in table 10.1.2-24

UE#2 acknowledges receipt of the Resume request (17) with a 200-OK final response, sent to P-CSCF#2.

Table 10.1.2-24: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933617 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 6402 RTP/AVP 97
b=AS:25.4
a=sendrecv
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2

```

25. 200-OK (P-CSCF to S-CSCF) – see example in table 10.1.2-25

P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.

Table 10.1.2-25: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

Contact: A locally defined value that identifies the UE.

P-CSCF restores the Via headers and Record-Route headers from the branch value in its Via.

26. 200-OK (S-CSCF to S-CSCF) – see example in table 10.1.2-26

S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.

Table 10.1.2-26: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

27. 200-OK (S-CSCF to P-CSCF) – see example in table 10.1.2-27

S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.

Table 10.1.2-27: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

28. 200-OK (P-CSCF to UE) – see example in table 10.1.2-28

P-CSCF#1 forwards the 200 OK final response to UE#1.

Table 10.1.2-28: 200 OK (P-CSCF to UE)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information

29. UE Resume Media Flow**30. ACK (UE to P-CSCF) – see example in table 10.1.2-30****Table 10.1.2-30: ACK (UE to P-CSCF)**

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 ACK
Content-Length: 0

```


Cseq: Is required to be the same value as Cseq contained in original INVITE request

31. ACK (P-CSCF to S-CSCF) – see example in table 10.1.2-31

Table 10.1.2-31: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

32. ACK (S-CSCF to S-CSCF) – see example in table 10.1.2-32

Table 10.1.2-32: ACK (S-CSCF to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

33. ACK (S-CSCF to P-CSCF) – see example in table 10.1.2-33

Table 10.1.2-33: ACK (S-CSCF to P-CSCF)

```
ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

34. ACK (P-CSCF to UE) – see example in table 10.1.2-34

Table 10.1.2-34: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
Cseq:
Content-Length:
```

10.1.3 Mobile-initiated hold and resume of a mobile-PSTN session

An IM session was previously established between an initiating UE and a MGCF acting as a gateway for a session terminating on the PSTN, or between an initiating MGCF acting as a gateway for a session originating on the PSTN to a terminating UE. The UE has an associated P-CSCF in the same network where it is currently located (either home or roaming), an S-CSCF assigned in its home network, and a BGCF that chooses the MGCF. These functional elements co-operate to clear the session, and the procedures are independent of whether they are located in the subscriber's home or visited networks. Therefore there is no distinction in this clause of home network vs. visited network.

The session hold and resume procedure is similar whether the UE initiated the session to the PSTN, or if the PSTN initiated the session to the UE. The only difference is the optional presence of the BGCF in the case of a session initiated by the UE. The BGCF might or might not be present in the signalling path after the first INVITE is routed.

These procedures show only one combination of Mobile-Originated, Serving-to-Serving, and Mobile-Terminated procedures, MO#2, S-S#3, and CS-T. These procedures do not show the use of optional I-CSCFs, or the use of the BGCF in achieving network configuration independence. If an I-CSCF/BGCF was included in the signalling path during the session establishment procedure, it would continue to be used in any subsequent signalling flows such as the ones described in this clause. Procedures at the I-CSCFs are identical to those described for the BYE, PRACK, and COMET requests and responses described in other clauses.

The procedures for placing a media stream on hold, and later resuming the media stream, are as shown in figure 10.1.3-1:

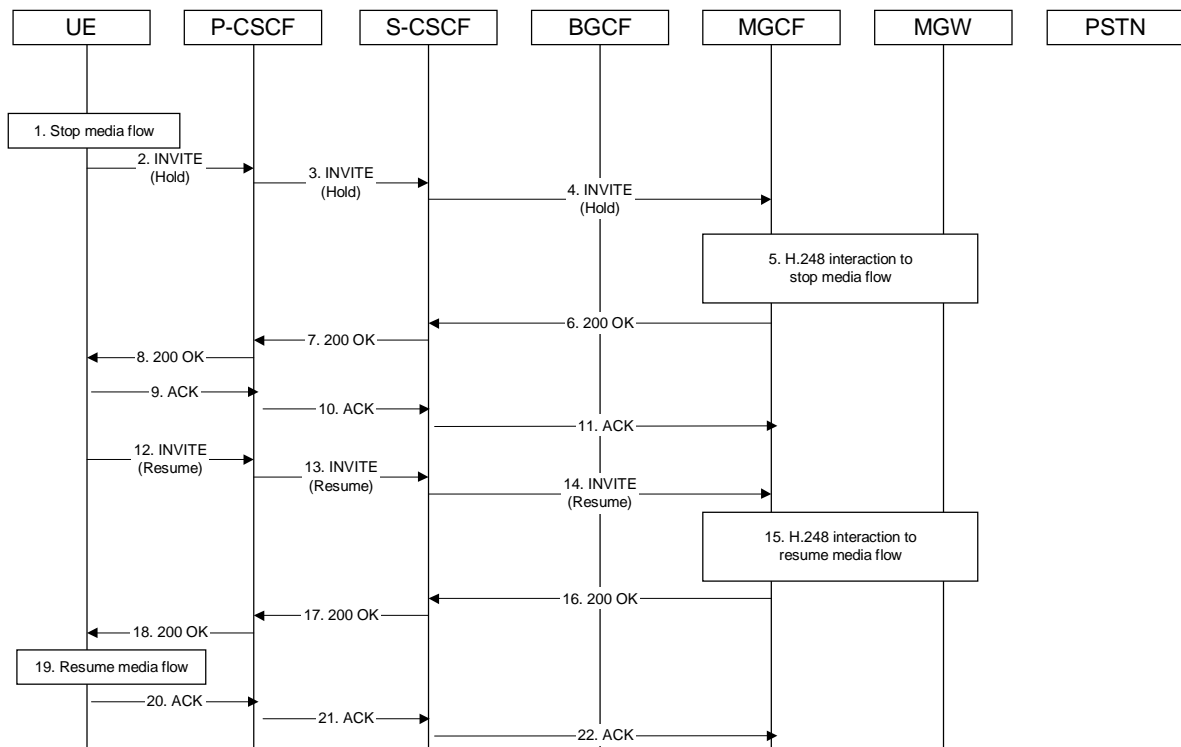


Figure 10.1.3-1: Mobile to PSTN session hold and resume

Signalling flow procedures are as follows:

1. Stop Media Flow

UE#1 detects a request from the subscriber to place a media stream on hold. UE#1 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.

2. INVITE (Hold) (UE to P-CSCF) – see example in 10.1.3-2

UE sends a Hold request to its proxy, P-CSCF.

Table 10.1.3-2: INVITE (Hold) (UE to P-CSCF)

```

INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933616 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=sendonly
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2

```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.
SDP	The sendrecv media stream is placed on hold by changing it to sendonly media stream, and no media is sent to the far end.

3. INVITE (Hold) (P-CSCF to S-CSCF) – see example in table 10.1.3-3

P-CSCF adds a Route header, with the saved value from the previous 200-OK response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF forwards the Hold request to S-CSCF.

Table 10.1.3-3: INVITE (Hold) (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:mgcf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

4. INVITE (Hold) (S-CSCF to MGCF) – see example in table 10.1.3-4

S-CSCF forwards the Hold request to MGCF.

Table 10.1.3-4: INVITE (Hold) (S-CSCF to MGCF)

```
INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

5. H.248 Interaction to Stop Media flow

MGCF initiates a H.248 interaction with MGW instructing it to stop sending the media stream, but to keep the resources for the session reserved.

6. 200-OK (MGCF to S-CSCF) – see example in table 10.1.3-6

MGCF acknowledges receipt of the Hold request (4) with a 200-OK final response, sent to S-CSCF.

Table 10.1.3-6: 200 OK (MGCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933616 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=recvonly
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
```

SDP: Since the media stream was offered as sendonly, it is marked as recvonly in the response.

7. 200-OK (S-CSCF to P-CSCF) – see example in table 10.1.3-7

S-CSCF forwards the 200 OK final response to P-CSCF.

Table 10.1.3-7: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
```

8. 200-OK (P-CSCF to UE) – see example in table 10.1.3-8

P-CSCF forwards the 200 OK final response to UE.

Table 10.1.3-8: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information

9. ACK (UE to P-CSCF) – see example in table 10.1.3-9

Table 10.1.3-9: ACK (UE to P-CSCF)

```
ACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 ACK
Content-Length: 0
```

Cseq: Is required to be the same value as Cseq contained in original INVITE request.

10. ACK (P-CSCF to S-CSCF) – see example in table 10.1.3-10

Table 10.1.3-10: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:
```

11. ACK (S-CSCF to MGCF) – see example in table 10.1.3-11

Table 10.1.3-11: ACK (S-CSCF to MGFC)

```
ACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

12. INVITE(Resume) (UE to P-CSCF) – see example in table 10.1.3-12

UE detects a request from the subscriber to resume the media stream previously placed on hold. UE sends a Resume request to its proxy, P-CSCF.

Table 10.1.3-12: INVITE(Resume) (UE to P-CSCF)

```
INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933617 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=sendrecv
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
```

Request-URI: Contains the value of the Contact header from the 200-OK response to the initial INVITE.

Via: Contains the IP address or FQDN of the originating UE.

From:/To:/Call-ID: Contain the values previously used to establish the session, including the tag value from the response.

Cseq: Next higher sequential value.

Contact: The IP address or FQDN of the originating UE.

SDP Same SDP as negotiated during the session setup, restores the sendrecv media stream.

13. INVITE(Resume) (P-CSCF to S-CSCF) – see example in table 10.1.3-10

P-CSCF adds a Route header, with the saved value from the previous 200-OK response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF forwards the Resume request to S-CSCF.

Table 10.1.3-13: INVITE(Resume) (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:mgcf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

14. INVITE(Resume) (S-CSCF to MGCF) – see example in table 10.1.3-14

S-CSCF forwards the Resume request to MGCF.

Table 10.1.3-14: INVITE(Resume) (S-CSCF to MGCF)

```

INVITE sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

15. H.248 Interaction to Resume media flow

MGCF initiates a H.248 interaction with MGW instructing it to resume sending the media stream.

16. 200-OK (MGCF to S-CSCF) – see example in table 10.1.3-16

MGCF acknowledges receipt of the Resume request (11) with a 200-OK final response, sent to S-CSCF.

Table 10.1.3-16: 200 OK (MGCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=0
o=- 2987933615 2987933617 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=audio 6402 RTP/AVP 97
b=AS:25.4
a=sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
```

17. 200-OK (S-CSCF to P-CSCF) – see example in table 10.1.3-17**Table 10.1.3-17: 200 OK (S-CSCF to P-CSCF)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

18. 200-OK (P-CSCF to UE) – see example in table 10.1.3-18

P-CSCF forwards the 200 OK final response to UE.

Table 10.1.3-18: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

19. Resume Media Flow

UE resumes sending the media stream to the remote endpoint.

20. ACK (UE to P-CSCF) – see example in table 10.1.3-20

Table 10.1.3-20: ACK (UE to P-CSCF)

```
ACK sip:mgcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 ACK
Content-Length: 0
```

Cseq: Is required to be the same value as Cseq contained in original INVITE request.

21. ACK (P-CSCF to S-CSCF) – see example in table 10.1.3-21

Table 10.1.3-21: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:mgcf1.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:
```

22. ACK (S-CSCF to MGCF) – see example in table 10.1.3-22

Table 10.1.3-22: ACK (S-CSCF to MGFC)

```

ACK sip:mggcf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

10.2 Initiating and destination party identification

10.2.1 Introduction

When the UE (or MGCF) initiates a session in the IM CN subsystem, it shall determine, based on preferences of the initiating user, whether its identity is to be made available to the destination, or to remain anonymous. Three cases shall be distinguished:

1. The initiating user desires his/her identity to be anonymous.
2. The initiating user desires to be identified as the initiator of the session.
3. The initiating user did not state a preference for this session.

The values of the headers "From", "To", "Call-ID", "Remote-Party-ID", and "Contact" shall be based on the decision above.

When the UE (or MGCF) receives an incoming session request in the IM CN subsystem, it shall determine, based on preferences of the destination user, whether its identity is to be made available to the initiator or to remain anonymous. Three cases shall be distinguished:

1. The destination user desires his/her identity to be anonymous.
2. The destination user desires to be identified as the destination of the session.
3. The destination user did not state a preference for this session.

The values of the header "Remote-Party-ID" shall be based on the decision above.

The rules for processing the header values at a proxy are given in draft-ietf-sip-privacy-01.

10.2.2 IM sessions with session initiator desiring anonymity

If the initiating user desires the session to be anonymous, the following rules shall be followed in generating header values:

From:	UE shall provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. Username shall be empty.
To:	If a telephone number is used in the addr-spec, the UE shall provide a full E.164 number including the country code. Otherwise, the UE shall provide a cryptographically random identifier for the userinfo, different from the value of the From header, and a non-identifying hostname, e.g. "localhost" in the host name.
Call-ID:	UE shall provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. This may be identical to the "From" header value.
Contact:	The userinfo shall either be empty, or be the same cryptographically random identifier that appears in the From header. The hostname shall be an IP address rather than an FQDN.
Remote-Party-ID:	UE shall include the subscriber identity and URL in the Remote-Party-ID header, with a tag "privacy=full"

An example of an initial INVITE request following the rules for an anonymous session is given in table 10.2.2-1. This revised information would appear as step #1 of MO#1a (subclause 7.2.2), MO#1b (subclause 17.2.2), MO#2 (subclause 7.2.3), and step #4 of CS-O (subclause 7.2.4).

Table 10.2.2-1: INVITE (Anonymous session)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=full
Anonymity: Off
From: sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

- From:** Contains a cryptographically random identifier for the userinfo, and a non-identifying hostname ("localhost") for the hostname. Username is empty.
- To:** Contains a cryptographically random identifier for the userinfo, distinct from the value of the From header, and a non-identifying hostname ("localhost") for the hostname. Username is empty.
- Call-ID:** Contains a cryptographically random identifier for the userinfo, and a non-identifying hostname ("localhost") for the hostname. This value is, in this example, identical to the From header value.

The values of From, To, Call-ID, and Remote-Party-ID, as given above, are carried through the INVITE sequence, through the S-CSCF serving the destination subscriber. When S-CSCF#2 forwards the INVITE request to the termination procedure (step #11 of S-S#1a, step #13 of S-S#1b, step#11 of S-S#2, step#4 of MT#1a, step#4 of MT#1b, step#4 of MT#2), the Remote-Party-ID header is updated with a private URL. An example of this INVITE request is given in table 10.2.2-2.

Table 10.2.2-2: INVITE (S-S to MT)

```

INVITE sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: <sip:token(tel:+1-212-555-1111)@scscf2.home2.net;user=private>
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Remote-Party-ID: Contains a cryptographically random identifier for the userinfo, generated from the originating subscriber information, and the hostname identifying the S-CSCF that generated the userinfo string. Username is empty.

When an I-CSCF is used to maintain configuration independence, it may (based on operator preferences) update the Remote-Party-ID header in order to hide the S-CSCF address. This occurs in MT#1b step #5. If so, it generates a new private URL with its own hostname. An example of this INVITE request is given in table 10.2.2-3.

Table 10.2.2-3: INVITE (I-CSCF to P-CSCF)

```

INVITE sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: <sip:Token(token(tel:+1-212-555-1111)@scscf2.home2.net;
user=private)@icscf.home2.net;user=private>
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Remote-Party-ID: Contains a cryptographically random identifier for the userinfo, generated from the originating subscriber information, and the hostname identifying the I-CSCF that generated the userinfo string. Username is empty.

10.2.3 IM sessions with session initiator being identified

If the initiating user desires to be identified as the session originator, the following rules shall be followed in generating header values:

From:	UE may provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. The username may be provided as an identification string.
To:	If a telephone number is used in the addr-spec, the UE may provide a full E.164 number including the country code. Otherwise, the UE may provide a cryptographically random identifier for the userinfo, which shall be different from the value of the From header, and a non-identifying hostname, e.g. "localhost" in the host name. The username may be provided as an identification string.
Call-ID:	UE may provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. This may be identical to the "From" header value.
Contact:	The userinfo may either be empty, or be the same cryptographically random identifier that appears in the From header. The hostname may be an IP address or an FQDN.
Remote-Party-ID:	UE shall include the subscriber identity and URL in the Remote-Party-ID header, with a tag "privacy=off"

An example of an initial INVITE request following the rules for an identified session is given in table 10.2.3-1.

Table 10.2.3-1: INVITE (Identified session)

<pre> INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0 Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd] Supported: 100rel Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>; privacy=off Proxy-Require: privacy Anonymity: Off From: "Alien Blaster" <tel:+1-212-555-1111>;tag=171828 To: sip:555-2222@home2.net;user=phone Call-ID: B36(SHA-1(+1-212-555-1111;time=36123E5B;seq=72))@[5555::aaa:bbb:ccc:ddd] Cseq: 127 INVITE Contact: sip:[5555::aaa:bbb:ccc:ddd] 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=907165275 0 m=audio 3456 RTP/AVP 97 3 96 b=AS:25.4 a=rtpmap:97 AMR a=fmtp:97 mode-set=0,2,5,7; maxframes=2 a=rtpmap:96 G726-32/8000 a=qos:mandatory sendrecv </pre>

An additional example of signalling flows for this situation, are those contained in clause 8.

10.2.4 IM sessions without initiator preference for anonymity

If the initiating user did not state a preference for whether the session be anonymous, local policies and regulations may force the network operator to make it anonymous. Therefore, the following rules shall be followed in generating header values:

From:	UE shall provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. Username may be empty, or may provide an identifying string. Any identifying string should not identify the subscriber.
To:	If a telephone number is used in the addr-spec, the UE shall provide a full E.164 number including the country code. Otherwise, the UE shall provide a cryptographically random identifier for the userinfo, different from the value of the From header, and a non-identifying hostname, e.g. "localhost" in the host name.
Call-ID:	UE shall provide a cryptographically random identifier for the userinfo, and a non-identifying hostname, e.g. "localhost" in the host name. This may be identical to the "From" header value.
Contact:	The userinfo shall either be empty, or be the same cryptographically random identifier that appears in the From header. The hostname shall be an IP address rather than an FQDN.
Remote-Party-ID:	UE shall include the subscriber identity and URL in the Remote-Party-ID header, without a "privacy" tag.

An example of an initial INVITE request following the rules for an unspecified session is given in table 10.2.4-1.

Table 10.2.4-1: INVITE (Unspecified session)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: B36(SHA-1(+1-212-555-1111;time=36123E5B;seq=72))@localhost
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

- From:** Contains a cryptographically random identifier for the userinfo, and a non-identifying hostname ("localhost") for the hostname. Username contains a string that does not identify the subscriber.
- To:** Contains a cryptographically random identifier for the userinfo, distinct from the value of the From header, and a non-identifying hostname ("localhost") for the hostname. Username is empty.
- Call-ID:** Contains a cryptographically random identifier for the userinfo, and a non-identifying hostname ("localhost") for the hostname. This value is, in this example, identical to the From header value.

The values of From, To, Call-ID, and Remote-Party-ID, as given above, are carried through the INVITE sequence, through the S-CSCF serving the destination subscriber.

Based on local policy or regulatory requirements, the S-CSCF serving the destination subscriber may either allow the identification information to be given to the destination (by following the example in subclause 10.2.2), or may restrict it (by following the example in subclause 10.2.1).

10.2.5 IM sessions with destination requesting anonymity

If the destination user desires the session to be anonymous, the UE shall indicate this in the value of the Remote-Party-ID header in the first non-100 response to the initial INVITE. An example of this response from UE to P-CSCF (step#8 of MT#1a, step#10 of MT#1b, step#8 of MT#2), is given in table 10.2.5-1.

Table 10.2.5-1: 183 Session Progress (UE to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf.visited1.net;branch=token1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=full
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm

```

Remote-Party-ID: Identifies the answering subscriber. It contains the public user identity, and the name of the answering party. The tag "privacy=full" is appended to indicate Anonymity is requested.

The value of the Remote-Party-ID header is carried through the 183-Session-Progress sequence, to the S-CSCF serving the initiating subscriber. When S-CSCF#1 forwards the 183-Session-Progress response to the originating procedure (step#16 of S-S#1a, step#19 of S-S#1b, step#16 of S-S#2, also step#9 of MO#1a, step#11 of MO#1b, step#9 of MO#2), the Remote-Party-ID header is updated with a private URL. An example of this 183-Session-Progress response is given in table 10.2.5-2.

Table 10.2.5-2: 183 Session Progress (S-SCSF to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: <sip:token(tel:+1-212-555-2222)@scscf1.home1.net;user=private>
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

Remote-Party-ID: Contains a cryptographically random identifier for the userinfo, generated from the originating subscriber information, and the hostname identifying the S-CSCF that generated the userinfo string. Username is empty.

When an I-CSCF is used to maintain configuration independence, it may (based on operator preferences) update the Remote-Party-ID header in order to hide the S-CSCF address. This occurs in MO#1b step #12. If so, it generates a new private URL with its own hostname. An example of this INVITE request is given in table 10.2.5-3.

Table 10.2.5-3: 183 Session Progress (S-CSCF to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: <sip:Token(token(tel:+1-212-555-2222))@scscf1.home1.net;
  user=private)@icscf.home1.net;user=private>
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

Remote-Party-ID: Contains a cryptographically random identifier for the userinfo, generated from the originating subscriber information, and the hostname identifying the I-CSCF that generated the userinfo string. Username is empty.

10.2.6 IM sessions with destination party being identified

If the destination user desires to be identified, the privacy tag of the Remote-Party-ID header indicate "privacy=off". An example of this response from UE to P-CSCF (step#8 of MT#1a, step#10 of MT#1b, step#8 of MT#2), is given in table 10.2.6-1.

Table 10.2.6-1: 183 Session Progress (UE to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf.visited.net;branch=token1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
```


Remote-Party-ID: Identifies the answering subscriber. It contains the public user identity, and the name of the answering party. The tag "privacy=off" is appended to indicate Anonymity is not requested.

An additional example of signalling flows for this situation, are those contained in clause 8.

10.2.7 IM sessions without destination preference for anonymity

If the destination user did not state a preference for whether the session be anonymous, local policies and regulations may force the network operator to make it anonymous. The destination UE indicates its lack of preference by not providing a "privacy" tag on the Remote-Party-ID header. An example of this response from UE to P-CSCF (step#8 of MT#1a, step#10 of MT#1b, step#8 of MT#2), is given in table 10.2.7-1.

Table 10.2.7-1: 183 Session Progress (UE to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf.visited.net;branch=token1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
```

Remote-Party-ID: Identifies the answering subscriber. It contains the public user identity, and the name of the answering party. The lack of a tag "privacy=" indicates lack of a preference for an anonymous or identified session.

Based on local policy or regulatory requirements, the S-CSCF serving the originating subscriber may either allow the identification information to be given to the initiator (by following the example in subclause 10.2.6), or may restrict it (by following the example in subclause 10.2.5).

10.3 Procedures for codec and media flow negotiations

10.3.1 Introduction

This subclause gives signalling flows for the procedures for determining the set of mutually-supported codecs between the endpoints of a multimedia session, determining the initial codecs to be used for the multimedia session, and the procedures for changing between codecs when multiple ones are supported.

Editor's note: If transcoding is to be supported, these procedures need to be adjusted.

10.3.2 Codec or media flow change within the existing reservation

After the multimedia session is established, it is possible for either endpoint to change the set of media flows or codec for a media flow. If the change is within the resources already reserved, then it is only necessary to synchronise the change with the other endpoint. An admission control decision will not fail if the new resource request is within the existing reservation.

The signalling flow for changing a codec within an existing reservation is given in figure 10.3.2-1.

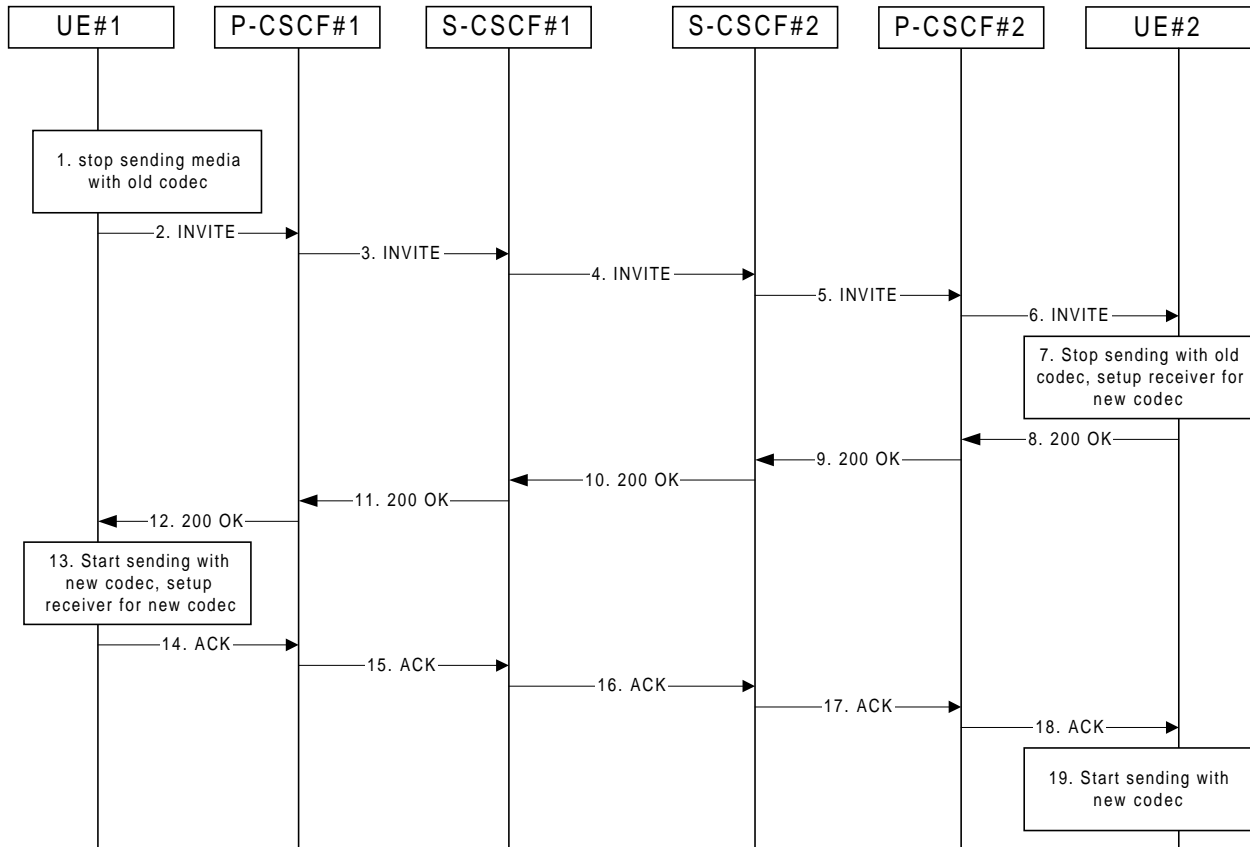


Figure 10.3.2-1: Codec or media flow change - same reservation

For this example, we assume the session was established with authorization for two codecs, AMR and G726-32, but that AMR was initially chosen for the media. UE#1 now desires to change the media to use G726-32.

The detailed procedure is as follows:

1. UE#1 stops sending media with old codec.

UE#1 determines that a new media stream is desired, or that a change is needed in the codec in use for an existing media stream. UE#1 evaluates the impact of this change, and determines the existing resources reserved for the session are adequate. UE#1 builds a revised SDP that includes all the common media flows determined by the initial negotiation, but assigns a codec and port number only to those to be used onward. UE#1 stops transmitting media streams on those to be dropped from the session.

2. INVITE (UE to P-CSCF) – see example in table 10.3.2-2

UE#1 sends the INVITE request to P-CSCF#1 containing this SDP.

Table 10.3.2-2: INVITE (UE to P-CSCF)

```

INVITE sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(user2_public1@home2.net; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP
m=video 0 RTP/AVP
m=audio 3456 RTP/AVP 96
b=AS:25.4
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP

```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
Route:	sip:[5555::eee:fff:aaa:bbb].
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.
SDP	The SDP contains the revised set of codecs desired by UE#1.

3. INVITE (P-CSCF to S-CSCF) – see example in table 10.3.2-3

P-CSCF#1 forwards the INVITE request to S-CSCF#1.

Table 10.3.2-3: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net
Record-Route: sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

4. INVITE (S-CSCF to S-CSCF) – see example in table 10.3.2-4

S-CSCF#1 forwards the INVITE request, through the S-CSCF to S-CSCF signalling flow procedures, to S-CSCF#2.

Table 10.3.2-4: INVITE (S-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net
Record-Route: sip:332b23.1@scscf1.home1.net, sip:240f34.1@pcscf1.visited1.net,
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

5. INVITE (S-CSCF to P-CSCF) – see example in table 10.3.2-5

S-CSCF#3 forwards the INVITE request to P-CSCF#2.

Table 10.3.2-5: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:361k21.1@pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net,
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

6. INVITE (P-CSCF to UE) – see example in table 10.3.2-6

P-CSCF#2 forwards the INVITE request to UE#2.

Table 10.3.2-6: INVITE (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Contact: token3@pcscf2.home2.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

7. UE#2 stops sending with old codec, and initializes receiver for new codec

UE#2 receives the INVITE request, and agrees that it is a change within the previous resource reservation. UE#2 stops sending the media streams to be deleted, and initialises its media receivers for the new codec.

UE#2 may optionally perform an alerting function at this point, and respond to UE#1 with a 180 Ringing provisional response (not shown in figure). When it is ready for the new media stream, UE#2 responds with a 200 OK.

8. 200 OK (UE to P-CSCF) – see example in table 10.3.2-8

UE#2 responds to the INVITE request (6) with a 200 OK response, sent to P-CSCF#2.

Table 10.3.2-8: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq: 131 INVITE
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555:: eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP
m=video 0 RTP/AVP
m=audio 6544 RTP/AVP 96
b=AS:25.4
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP

```

9. 200 OK (P-CSCF to S-CSCF) – see example in table 10.3.2-9

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.3.2-9: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net,
From:
To:
Call-ID:
CSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

10. 200 OK (S-CSCF to S-CSCF) – see example in table 10.3.2-10

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.3.2-10: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:240f34.1@pcscf1.visited1.net,
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

11. 200 OK (S-CSCF to P-CSCF) – see example in table 10.3.2-11

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.3.2-11: 200 OK (S-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

12. 200 OK (P-CSCF to UE) – see example in table 10.3.2-12

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.3.2-12: 200 OK (P-CSCF to UE)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

13. UE#1 starts sending with new codec, and initializes receiver for new codec

UE#1 starts sending media using the new codecs. UE#1 also releases any excess resources no longer needed.

14. ACK (UE to P-CSCF) – see example in table 10.3.2-14

UE#1 sends the ACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.2-14: ACK (UE to P-CSCF)

```

ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(user2_public1@home2.net; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 ACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0

```

15. ACK (P-CSCF to S-CSCF) – see example in table 10.3.2-15

P-CSCF#1 sends the ACK request to S-CSCF#1, along the signalling path established by the INVITE request.

Table 10.3.2-15: ACK (P-CSCF to S-CSCF)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:361k21.1@pcscf2.visited2.net
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200 OK response (with first element moved to Request-URI).

16. ACK (S-CSCF to S-CSCF) – see example in table 10.3.2-16

S-CSCF#1 sends the ACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.2-16: ACK (S-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

17. ACK (S-CSCF to P-CSCF) – see example in table 10.3.2-17

S-CSCF#2 sends the ACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.2-17: ACK (S-CSCF to P-CSCF)

```

ACK sip:361k21.1@pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```


18. ACK (P-CSCF to UE) – see example in table 10.3.2-18

P-CSCF#2 sends the ACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.2-18: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token5
From:
To:
Call-ID:
Cseq:
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

19. UE#2 starts sending with new codec

UE#2 starts sending media using the new codecs. UE#2 also releases any excess resources no longer needed.

10.3.3 Codec or media flow change requiring new resources and/or authorisation

After the multimedia session is established, it is possible for either endpoint to change the set of media flows or codec for a media flow. If the change requires additional resources beyond those previously reserved, then it is necessary to perform the resource reservation and bearer establishment procedures. If the reservation request fails for whatever reason, the original multimedia session remains in progress.

An example signalling flow for a codec or media flow change requiring new resources and/or authorization is given in figure 10.3.3-1. This example shows mobile originated while in home network, establishing a session with another mobile served by the same network operator, also in its home network (MO#2, S-S#2, MT#2). Other configurations may include I-CSCFs in the signalling path; procedures at the I-CSCFs are identical to those described for the BYE, PRACK, and COMET requests and responses described in other clauses.

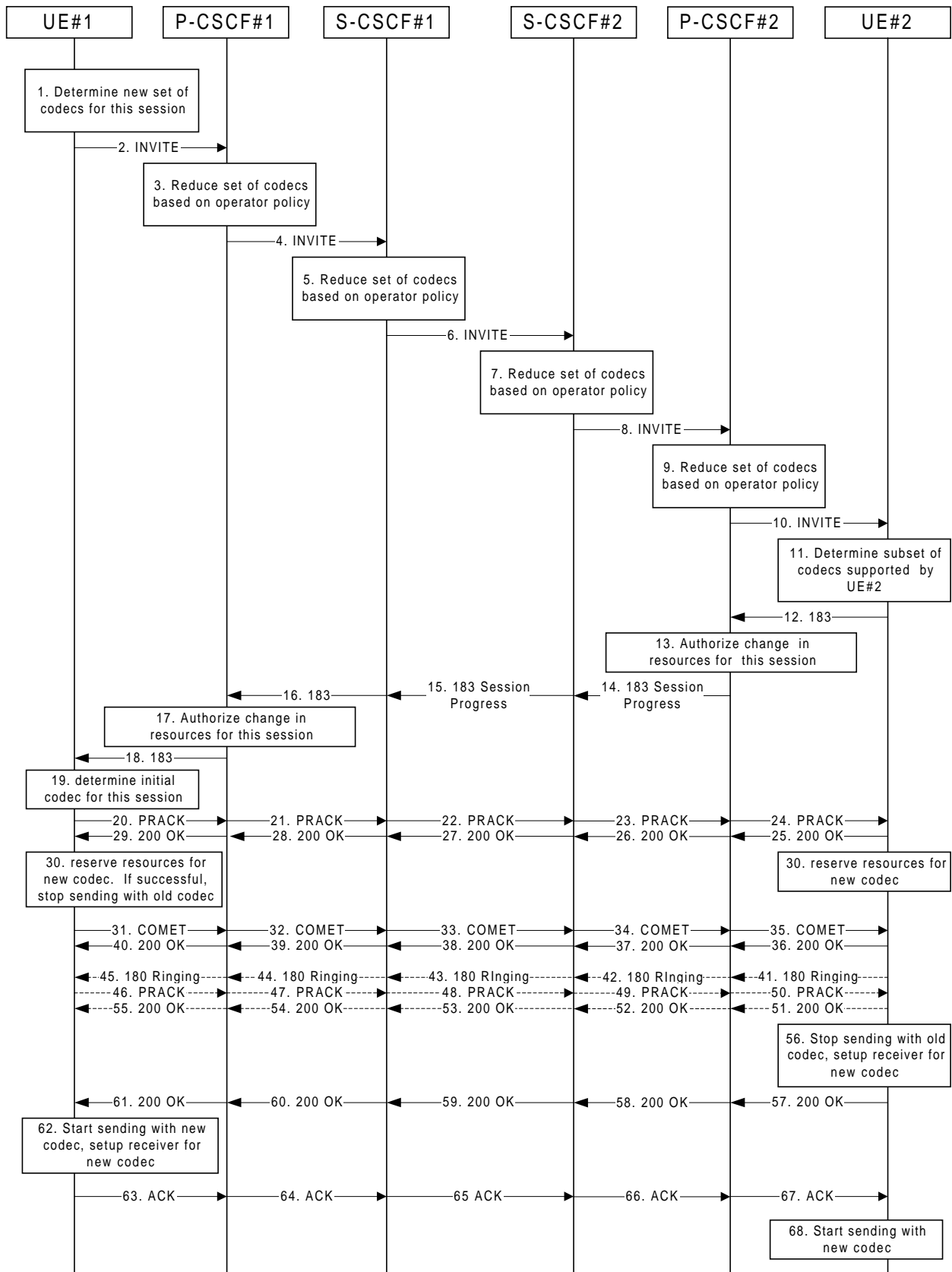


Figure 10.3.3-1: Codec or media flow change - new reservation

The detailed procedure is as follows:

1. Determine new set of codecs for this session

UE#1 determines the revised set of codecs that it wishes to support for this session. It builds a SDP containing bandwidth requirements and characteristics of each, and assigns local port numbers for each possible media flow. Multiple media flows may be offered, and for each media flow (m= line in SDP), there may be multiple codec choices offered.

For this example, assume UE#1 originally established the session using audio (AMR) only, and now wishes to change to stereo (using the L16 2-channel codec, RTP/AVP code 10) and add an additional video media stream (MPV).

2. INVITE (UE to P-CSCF) – see example in table 10.3.3-2

UE#1 sends the INVITE request to P-CSCF#1 containing this SDP.

Table 10.3.3-2: INVITE (UE to P-CSCF)

```

INVITE sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfgk490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 10
b=AS:25.4
a=qos:mandatory sendrecv

```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.
SDP	The SDP contains the revised set of codecs desired by UE#1.

3. P-CSCF reduces set of supported codecs based on operator policy

P-CSCF#1 examines the media parameters, and removes any choices that the network operator decides based on local policy, not to allow on the network.

4. INVITE (P-CSCF to S-CSCF) – see example in table 10.3.3-4

P-CSCF#1 forwards the INVITE request to S-CSCF#1.

Table 10.3.3-4: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

5. S-CSCF reduces set of supported codecs based on operator policy

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

6. INVITE (S-CSCF to S-CSCF) – see example in table 10.3.3-6

S-CSCF#1 forwards the INVITE request, through the S-CSCF to S-CSCF signalling flow procedures, to S-CSCF#2.

Table 10.3.3-6: INVITE (S-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

7. S-CSCF reduces set of supported codecs based on operator policy

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

8. INVITE (S-CSCF to P-CSCF) – see example in table 10.3.3-8

S-CSCF#3 forwards the INVITE request to P-CSCF#2.

Table 10.3.3-8: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=
```

9. P-CSCF reduces set of supported codecs based on operator policy

P-CSCF#2 examines the media parameters, and removes any that the network operator decides, based on local policy, not to allow on the network.

10. INVITE (P-CSCF to UE) – see example in table 10.3.3-10

P-CSCF#2 forwards the INVITE request to UE#2.

Table 10.3.3-10: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Contact: token3@pcscf2.home2.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

11. Determine subset of codecs supported by UE#2

UE#2 determines the subset of codecs that it is capable of supporting for this session. It determines the intersection of those it supports with those appearing in the SDP in the INVITE request. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

For this example, assume UE#2 supports all those requested by UE#1.

12. 183 Session Progress (UE to P-CSCF) – see example in table 10.3.3-12

UE#2 returns a 183 Session Progress response, containing SDP listing common media flows and codecs, to P-CSCF#2.

Table 10.3.3-12: 183 Session Progress (UE to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pccscf2.visited.net;branch=token3
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 18
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::eee:fff:aaa:bbb
s=-
c=IN IP6 5555:: eee:fff:aaa:bbb
t=907165275 0
m=video 6540 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv confirm
a=rtpmap:99:MPV
m=audio 6544 RTP/AVP 10
b=AS:25.4
a=qos:mandatory sendrecv confirm
```

SDP The SDP contains the subset of codecs supported by UE#2.

13. Authorize resources for common codecs for this session

P-CSCF#2 authorises the QoS resources for the common media flows and codec choices.

14. 183 Session Progress (P-CSCF to S-CSCF) - see example in table 10.3.3-14

P-CSCF#2 forwards the 183 Session Progress response to S-CSCF#2.

Table 10.3.3-14: 183 Session Progress (P-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

15. 183 Session Progress (S-CSCF to S-CSCF) – see example in table 10.3.3-15

S-CSCF#2 forwards the 183 Session Progress response to S-CSCF#1.

Table 10.3.3-15: 183 Session Progress (S-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

16. 183 Session Progress (S-CSCF to P-CSCF) – see example in table 10.3.3-16

S-CSCF#1 forwards the 183 Session Progress response to P-CSCF#1.

Table 10.3.3-16: 183 Session Progress (S-CSCF to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

17. Authorize resources for common codecs for this session

P-CSCF#1 authorises the QoS resources for the remaining media flows and codec choices.

18. 183 Session Progress (P-CSCF to UE) – see example in table 10.3.3-18

P-CSCF#1 forwards the 183 Session Progress response to UE#1.

Table 10.3.3-18: 183 Session Progress (P-CSCF to UE)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:token1@pcscf1.home1.net
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:332b23.1@scscf1.home1.net, sip:764z87.1@scscf2.home2.net,
sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net

```


Contact: A locally unique token to identify the saved routing information.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3072".

19. Determine revised codec(s) for this session

UE#1 determines which media flows should be used for this session, and which codecs should be used for each of those media flows. If there was any change in media flows, or if there was more than one choice of codec for a media flow, then UE#1 must include an SDP in the PRACK request sent to UE#2.

For this example, assume UE#1 chooses L10 for stereo audio and MPV for video, so no changes are made to the SDP.

20. PRACK (UE to P-CSCF) – see example in table 10.3.3-20

UE#1 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-20: PRACK (UE to P-CSCF)

```
PRACK sip:token1@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 132 PRACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Rack: 18 131 INVITE
Content-Length: 0
```

Request-URI: Takes the value of the Contact header of the received 183 Session Progress response.

Via:, Contact: Take the value of either the IP address of FQDN of the originating UE.

From:/To:/Call-ID: Copied from the 183 Session Progress response so that they include any tag parameter.

Cseq: Takes a higher value than that in the previous request.

21. PRACK (P-CSCF to S-CSCF) – see example in table 10.3.3-21

P-CSCF#1 sends the PRACK request to S-CSCF#1, along the signalling path established by the INVITE request.

Table 10.3.3-21: PRACK (P-CSCF to S-CSCF)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Rack:
Content-Length:
```

Request-URI: The first component of the saved Route header.

Route: Saved from the previous response (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

22. PRACK (S-CSCF to S-CSCF) – see example in table 10.3.3-22

S-CSCF#1 sends the PRACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-22: PRACK (S-CSCF to S-CSCF)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:

```

Request-URI: the first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

23. PRACK (S-CSCF to P-CSCF) – see example in table 10.3.3-23

S-CSCF#2 sends the PRACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-23: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:

```

24. PRACK (P-CSCF to UE) – see example in table 10.3.3-24

P-CSCF#2 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-24: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token2
From:
To:
Call-ID:
Cseq:
Contact: token2@pcscf2.home2.net
Rack:
Content-Length:

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

25. 200 OK (UE to P-CSCF) – see example in table 10.3.3-25

UE#2 responds to the PRACK request (24) with a 200 OK response to P-CSCF#2.

Table 10.3.3-25: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token2
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

26. 200 OK (P-CSCF to S-CSCF) – see example in table 10.3.3-26

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.3.3-26: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:
```

27. 200 OK (S-CSCF to S-CSCF) – see example in table 10.3.3-27

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.3.3-27: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

28. 200 OK (S-CSCF to P-CSCF) – see example in table 10.3.3-28

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.3.3-28: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

29. 200 OK (P-CSCF to UE) – see example in table 10.3.3-29

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.3.3-29: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:token2@pcscf1.home1.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

30. Reserve resources for new media streams

UE#1 and UE#2 reserve the resources needed for the added or changed media flows. If the reservation is successfully completed by UE#1, it stops transmitting any deleted media streams.

31. COMET (UE to P-CSCF) – see example in table 10.3.3-31

UE#1 sends the COMET request to P-CSCF#1.

Table 10.3.3-31: COMET (UE to P-CSCF)

```
COMET sip:token1@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 133 COMET
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:success send
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 10
b=AS:25.4
a=qos:success send
```

Request-URI: Takes the value of the Contact header of the received 183 Session Progress response.

Via:, Contact: Take the value of either the IP address or FQDN of the originating UE.

From:/To:/Call-ID: Copied from the 183 Session Progress response so that they include any tag parameters.

CSeq: Takes a higher value than that in the previous request.

The SDP indicates that the resource reservation was successful.

32. COMET (P-CSCF to S-CSCF) – see example in table 10.3.3-32

P-CSCF#1 sends the COMET request to S-CSCF#1.

Table 10.3.3-32: COMET (P-CSCF to S-CSCF)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 183 Session Progress response (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

33. COMET (S-CSCF to S-CSCF) – see example in table 10.3.3-33

S-CSCF#1 sends the COMET request to S-CSCF#2.

Table 30.3.3-33: COMET (MO#2 to S-S)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

Request-URI: The first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

34. COMET (S-CSCF to P-CSCF) – see example in table 10.3.3-34

S-CSCF#2 sends the COMET request to P-CSCF#2.

Table 10.3.3-34: COMET (S-CSCF to P-CSCF)

```

COMET sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

35. COMET (P-CSCF to UE) – see example in table 10.3.3-35

P-CSCF#2 sends the COMET request to UE#2.

Table 10.3.3-35: COMET (P-CSCF to UE)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token6
From:
To:
Call-ID:
Cseq:
Contact: token6@pcscf2.home2.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

36. 200 OK (UE to P-CSCF) – see example in table 10.3.3-36

UE#2 responds to the COMET request (35) with a 200 OK response, sent to P-CSCF#2.

Table 10.3.3-36: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token6
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

37. 200 OK (P-CSCF to S-CSCF) – see example in table 10.3.3-37

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.3.3-37: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

38. 200 OK (S-CSCF to S-CSCF) – see example in table 10.3.3-38

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.3.3-38: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

39. 200 OK (S-CSCF to P-CSCF) – see example in table 10.3.3-39

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.3.3-39: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

40. 200 OK (P-CSCF to UE) – see example in table 10.3.3-40

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.3.3-40: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:token3@pcscf1.home1.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

41. 180 Ringing (UE to P-CSCF) – see example in table 10.3.3-41

Depending on the type of codec change being performed, alerting may be required at the destination UE. If so, UE#2 sends a 180 Ringing provisional response to the originator, through P-CSCF#2.

Table 10.3.3-41: 180 Ringing (UE to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 19
Content-Length: 0
```

42. 180 Ringing (P-CSCF to S-CSCF) – see example in table 10.3.3-42

P-CSCF#2 sends the 180 Ringing response to S-CSCF#2.

Table 10.3.3-42: 180 Ringing (P-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

43. 180 Ringing (S-CSCF to S-CSCF) – see example in table 10.3.3-43

S-CSCF#2 sends the 180 Ringing response to S-CSCF#1.

Table 10.3.3-43: 180 Ringing (S-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

44. 180 Ringing (S-CSCF to P-CSCF) – see example in table 10.3.3-44

S-CSCF#1 sends the 180 Ringing response to P-CSCF#1.

Table 10.3.3-44: 180 Ringing (S-CSCF to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

45. 180 Ringing (P-CSCF to UE) – see example in table 10.3.3-45

P-CSCF#1 sends the 180 Ringing response to UE#1.

Table 10.3.3-45: 180 Ringing (P-CSCF to UE)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:token4@pcscf1.home1.net
RSeq:
Content-Length:
```

Editor's Note: Additional QoS interactions to handle one-way media at this point (e.g. for PSTN ringback and announcements) is for further study.

46. PRACK (UE to P-CSCF) – see example in table 10.3.3-46

UE#1 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-46: PRACK (UE to P-CSCF)

```
PRACK sip:token4@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 130 PRACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Rack: 19 131 INVITE
Content-Length: 0
```

- Request-URI:** Takes the value of the Contact header of the 180 Ringing response.
- Via:, Contact:** Take the value of either the IP address or FQDN of the UE.
- From:/To:/Call-ID:** Copied from the 180 Ringing response so that they include any revised tag parameters.
- Cseq:** Takes a higher value than in the previous request.

47. PRACK (P-CSCF to S-CSCF) – see example in table 10.3.3-47

P-CSCF#1 sends the PRACK request to S-CSCF#1, along the signalling path established by the INVITE request.

Table 10.3.3-47: PRACK (P-CSCF to S-CSCF)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Rack:
Content-Length:
```

- Route:** P-CSCF adds a Route header, with the saved value from the previous response. P-CSCF identifies the proper saved value by the Request-URI.

48. PRACK (S-CSCF to S-CSCF) – see example in table 10.3.3-48

S-CSCF#1 sends the PRACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-48: PRACK (S-CSCF to S-CSCF)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

49. PRACK (S-CSCF to P-CSCF) – see example in table 10.3.3-49

S-CSCF#2 sends the PRACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-49: PRACK (S-CSCF to P-CSCF)

```
PRACK sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

50. PRACK (P-CSCF to UE) – see example in table 10.3.3-50

P-CSCF#2 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-50: PRACK (P-CSCF to UE)

```
PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token4
From:
To:
Call-ID:
Cseq:
Contact: token4@pcscf2.home2.net
Rack:
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

51. 200 OK (UE to P-CSCF) – see example in table 10.3.3-51

UE#2 responds to the PRACK request (50) with a 200 OK response to P-CSCF#2.

Table 10.3.3-51: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token4
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

52. 200 OK (P-CSCF to S-CSCF) – see example in table 10.3.3-52

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.3.3-52: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:
```

53. 200 OK (S-CSCF to S-CSCF) – see example in table 10.3.3-53

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.3.3-53: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
```

```
Contact:
Content-Length:
```

54. 200 OK (S-CSCF to P-CSCF) – see example in table 10.3.3-54

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.3.3-54: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

55. 200 OK (P-CSCF to UE) – see example in table 10.3.3-55

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.3.3-55: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:token5@pcscf1.home1.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

56. Perform Codec change

UE#2 stops sending the media streams to be deleted, and initialises its media receivers for the new codec.

57. 200 OK (UE to P-CSCF) – see example in table 10.3.3-57

UE#2 responds to the INVITE request (10) with a 200 OK response, sent to P-CSCF#2.

Table 10.3.3-57: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq: 131 INVITE
Content-Length: 0
```

58. 200 OK (P-CSCF to S-CSCF) – see example in table 10.3.3-58

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.3.3-58: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
```

```
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:
```

59. 200 OK (S-CSCF to S-CSCF) – see example in table 10.3.3-59

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.3.3-59: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

60. 200 OK (S-CSCF to P-CSCF) – see example in table 10.3.3-60

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.3.3-60: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

61. 200 OK (P-CSCF to UE) – see example in table 10.3.3-61

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.3.3-61: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:token6@pcscf1.home1.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

62. Start using new codec

UE#1 starts sending media using the new codecs. UE#1 also releases any excess resources no longer needed.

63. ACK (UE to P-CSCF) – see example in table 10.3.3-63

UE#1 sends the ACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-63: ACK (UE to P-CSCF)

```

ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgklkj490333
Cseq: 131 ACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0

```

64. ACK (P-CSCF to S-CSCF) – see example in table 10.3.3-64

P-CSCF#1 sends the ACK request to S-CSCF#1, along the signalling path established by the INVITE request.

Table 10.3.3-64: ACK (P-CSCF to S-CSCF)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaa%3abb%3acc%3add%5d@pcscf1.home1.net
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200 OK response (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

65. ACK (S-CSCF to S-CSCF) – see example in table 10.3.3-65

S-CSCF#1 sends the ACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-65: ACK (S-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

66. ACK (S-CSCF to P-CSCF) – see example in table 10.3.3-66

S-CSCF#2 sends the ACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.3-66: ACK (S-CSCF to P-CSCF)

```

ACK sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:

```

Content-Length:

67. ACK (P-CSCF to UE) – see example in table 10.3.3-67

P-CSCF#2 sends the ACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.3.3-67: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token5
From:
To:
Call-ID:
Cseq:
Contact: token5@pcscf2.home2.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

68. Start using new codec

UE#2 starts sending media using the new codecs. UE#2 also releases any excess resources no longer needed.

10.3.4 Error in changing codec or media flow within an existing reservation

After the multimedia session is established, it is possible for either endpoint to change the set of media flows or codec for a media flow. If the change is within the resources already reserved, then it is only necessary to synchronise the change with the other endpoint. An admission control decision will not fail if the new resource request is within the existing reservation.

However, it is possible the destination UE can no longer support the requested codec, due to, for example, other simultaneous sessions involving the destination UE. The destination UE therefore has the ability to refuse the codec change.

The signalling flow for refusing a codec change within an existing reservation is given in figure 10.3.4-1.

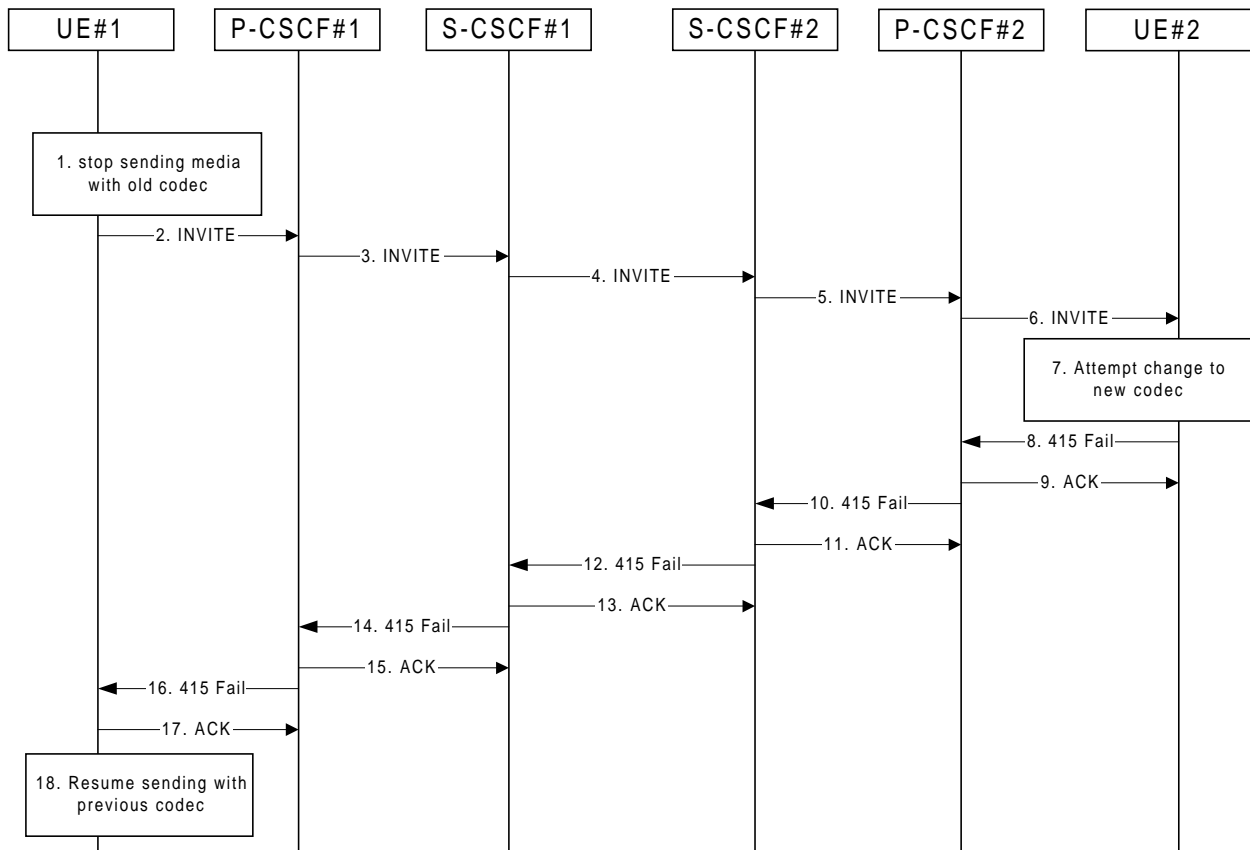


Figure 10.3.4-1: Error changing codec or media flow – within previous reservation

For this example, we assume the session was established with authorization for two codecs, AMR and G726-32, but that AMR was initially chosen for the media. UE#1 now desires to change the media to use G726-32.

The detailed procedure is as follows:

1. UE#1 stops sending media with old codec.

UE#1 determines that a new media stream is desired, or that a change is needed in the codec in use for an existing media stream. UE#1 evaluates the impact of this change, and determines the existing resources reserved for the session are adequate. UE#1 builds a revised SDP that includes all the common media flows determined by the initial negotiation, but assigns a codec and port number only to those to be used onward. UE#1 stops transmitting media streams on those to be dropped from the session.

2. INVITE (UE to P-CSCF) – see example in table 10.3.4-2

UE#1 sends the INVITE request to P-CSCF#1 containing this SDP.

Table 10.3.4-2: INVITE (UE to P-CSCF)

```

INVITE sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP
m=video 0 RTP/AVP
m=audio 3456 RTP/AVP 96
b=AS:25.4
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP

```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.
SDP	The SDP contains the revised set of codecs desired by UE#1.

3. INVITE (P-CSCF to S-CSCF) – see example in table 10.3.4-3

P-CSCF#1 forwards the INVITE request to S-CSCF#1.

Table 10.3.4-3: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

Request-URI:	The first component of the saved Route header.
Route:	Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

4. INVITE (S-CSCF to S-CSCF) – see example in table 10.3.4-4

S-CSCF#1 forwards the INVITE request, through the S-CSCF to S-CSCF signalling flow procedures, to S-CSCF#2.

Table 10.3.4-4: INVITE (S-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555:aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

5. INVITE (S-CSCF to P-CSCF) – see example in table 10.3.4-5

S-CSCF#3 forwards the INVITE request to P-CSCF#2.

Table 10.3.4-5: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555:aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=
```

6. INVITE (P-CSCF to UE) – see example in table 10.3.4-6

P-CSCF#2 forwards the INVITE request to UE#2.

Table 10.3.4-6: INVITE (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Contact: token3@pcscf2.home2.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
m=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

7. UE#2 attempts to change to new codec

UE#2 receives the INVITE request, and agrees that it is a change within the previous resource reservation. UE#2 encounters a failure attempting to change to the new codec, due to, e.g., internal resources that were available when the session was initiated but which are no longer available.

8. 415 Unsupported Media Type (UE to P-CSCF) – see example in table 10.3.4-8

UE#2 responds to the INVITE request (6) with a 415 Unsupported Media Type response, sent to P-CSCF#2.

Table 10.3.4-8: 415 Unsupported Media Type (UE to P-CSCF)

```

SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq: 131 INVITE
Content-Length: 0

```

9. ACK (P-CSCF to UE) – see example in table 10.3.4-9

P-CSCF#2 acknowledges the error response by sending an ACK request to UE#2.

Table 10.3.4-9: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

10. 415 Unsupported Media Type (P-CSCF to S-CSCF) – see example in table 10.3.4-10

P-CSCF#2 sends the 415 Unsupported Media Type response to S-CSCF#2.

Table 10.3.4-10: 415 Unsupported Media Type (P-CSCF to S-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

11. ACK (S-CSCF to P-CSCF) – see example in table 10.3.4-11

S-CSCF#2 acknowledges the error response by sending an ACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.4-11: ACK (S-CSCF to P-CSCF)

```
ACK sip:%5b5555%3a%3aeee%3afff%3aaaa%3abb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

12. 415 Unsupported Media Type (S-CSCF to S-CSCF) – see example in table 10.3.4-10

S-CSCF#2 sends the 415 Unsupported Media Type response to S-CSCF#1.

Table 10.3.4-10: 415 Unsupported Media Type (S-CSCF to S-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

13. ACK (S-CSCF to S-CSCF) – see example in table 10.3.4-13

S-CSCF#1 acknowledges the error response by sending an ACK request to S-CSCF#2.

Table 10.3.4-13: ACK (S-CSCF to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

14. 415 Unsupported Media Type (S-CSCF to P-CSCF) – see example in table 10.3.4-11

S-CSCF#1 sends the 415 Unsupported Media Type response to P-CSCF#1.

Table 10.3.4-11: 415 Unsupported Media Type (S-CSCF to P-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

15. ACK (P-CSCF to S-CSCF) – see example in table 10.3.4-15

P-CSCF#1 acknowledges the error response by sending an ACK request to S-CSCF#1.

Table 10.3.4-15: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

16. 415 Unsupported Media Type (P-CSCF to UE) – see example in table 10.3.4-16

P-CSCF#1 sends the 415 Unsupported Media Type response to UE#1.

Table 10.3.4-16: 415 Unsupported Media Type (P-CSCF to UE)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

17. ACK (UE to P-CSCF) – see example in table 10.3.4-17

UE#1 acknowledges the error response by sending an ACK request to P-CSCF#1.

Table 10.3.4-17: ACK (UE to P-CSCF)

```
ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

18. UE#1 resumes sending with previous codec

UE#1 resumes sending media using the previous codecs.

10.3.5 Error changing codec or media flows requiring new resources and/or authorisation

After the multimedia session is established, it is possible for either endpoint to change the set of media flows or codec for a media flow. If the change requires additional resources beyond those previously reserved, then it is necessary to perform the resource reservation and bearer establishment procedures. If the reservation request fails for whatever reason, the original multimedia session remains in progress.

If the destination UE is unable, or unwilling, to change to the new set of codecs, it may return a 415 Unsupported Media Type error response.

If the P-CSCF and/or S-CSCF disallow a particular media flow or codec appearing in the SDP from the initiating UE, and it is the last codec in the last media flow, the CSCF shall return a 415 Unsupported Media Type error response.

An example signalling flow for an error changing codec or media flow requiring new resources and/or authorization is given in figure 10.3.5-1. This is the case where the UE rejects the codec change; rejection by a CSCF is a subset of this signalling flow.

This example shows mobile originated while in home network, establishing a session with another mobile served by the same network operator, also in its home network (MO#2, S-S#2, MT#2). Other configurations may include I-CSCFs in the signalling path; procedures at the I-CSCFs are identical to those described for the BYE, PRACK, and COMET requests and responses described in other clauses.

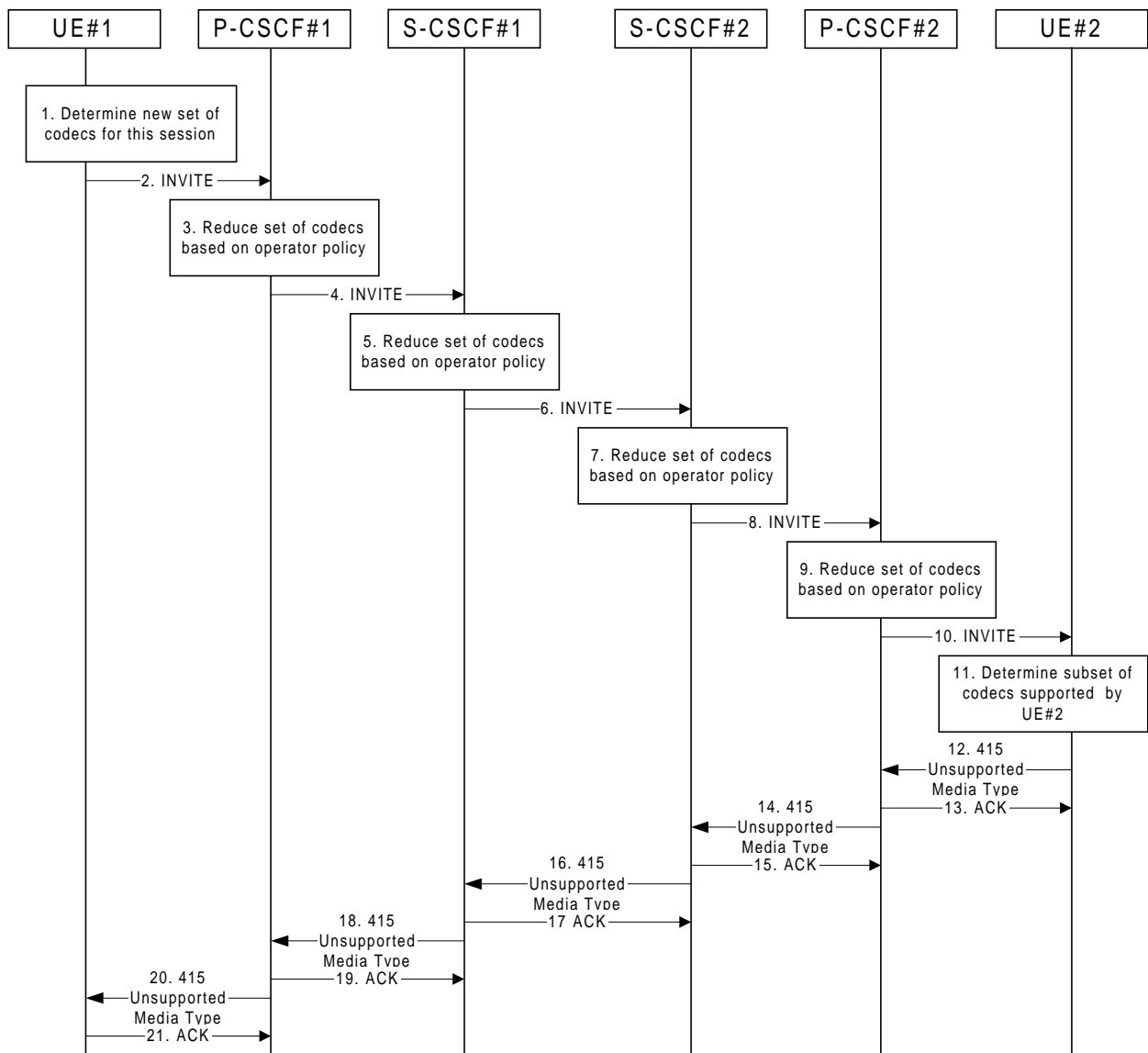


Figure 10.3.5-1: Error changing Codec or media flows needing a new reservation

The detailed procedure is as follows:

1. Determine new set of codecs for this session

UE#1 determines the revised set of codecs that it wishes to support for this session. It builds a SDP containing bandwidth requirements and characteristics of each, and assigns local port numbers for each possible media flow. Multiple media flows may be offered, and for each media flow (m= line in SDP), there may be multiple codec choices offered.

For this example, assume UE#1 originally established the session using audio (AMR) only, and now wishes to change to stereo (using the L16 2-channel codec, RTP/AVP code 10) and add an additional video media stream (MPV).

2. INVITE (UE to P-CSCF) – see example in table 10.3.5-2

UE#1 sends the INVITE request to P-CSCF#1 containing this SDP.

Table 10.3.5-2: INVITE (UE to P-CSCF)

```

INVITE sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfgk490333
Cseq: 131 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 10
b=AS:25.4
a=qos:mandatory sendrecv

```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.
SDP	The SDP contains the revised set of codecs desired by UE#1.

3. P-CSCF reduces set of supported codecs based on operator policy

P-CSCF#1 examines the media parameters, and removes any choices that the network operator decides based on local policy, not to allow on the network.

4. INVITE (P-CSCF to S-CSCF) – see example in table 10.3.5-4

P-CSCF#1 forwards the INVITE request to S-CSCF#1.

Table 10.3.5-4: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

Contact: A locally defined value that identifies the UE.

5. S-CSCF reduces set of supported codecs based on operator policy

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

6. INVITE (S-CSCF to S-CSCF) – see example in table 10.3.5-6

S-CSCF#1 forwards the INVITE request, through the S-CSCF to S-CSCF signalling flow procedures, to S-CSCF#2.

Table 10.3.5-6: INVITE (S-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=

```


7. S-CSCF reduces set of supported codecs based on operator policy

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

8. INVITE (S-CSCF to P-CSCF) – see example in table 10.3.5-8

S-CSCF#3 forwards the INVITE request to P-CSCF#2.

Table 10.3.5-8: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=
```

9. P-CSCF reduces set of supported codecs based on operator policy

P-CSCF#2 examines the media parameters, and removes any that the network operator decides, based on local policy, not to allow on the network.

10. INVITE (P-CSCF to UE) – see example in table 10.3.5-10

P-CSCF#2 forwards the INVITE request to UE#2.

Table 10.3.5-10: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Contact: token3@pcscf2.home2.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

11. Determine subset of codecs supported by UE#2

UE#2 determines the subset of codecs that it is capable of supporting for this session. It determines the intersection of those it supports with those appearing in the SDP in the INVITE request. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

For this example, assume UE#2 does not supports any of those requested by UE#1.

12. 415 Unsupported Media Type (UE to P-CSCF) – see example in table 10.3.5-12

UE#2 responds to the INVITE request (10) with a 415 Unsupported Media Type response, sent to P-CSCF#2.

Table 10.3.5-12: 415 Unsupported Media Type (UE to P-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP pcscf2.home2.net;branch=token3
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

13. ACK (P-CSCF to UE) – see example in table 10.3.5-13

P-CSCF#2 responds to the 415 Unsupported Media Type error (12) by sending an ACK request to UE#2.

Table 10.3.5-13: ACK (P-CSCF to UE)

```
ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

14. 415 Unsupported Media Type (P-CSCF to S-CSCF) – see example in table 10.3.5-14

P-CSCF#2 sends the 415 Unsupported Media Type response to S-CSCF#2.

Table 10.3.5-14: 415 Unsupported Media Type (P-CSCF to S-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

15. ACK (S-CSCF to P-CSCF) – see example in table 10.3.5-15

S-CSCF#2 responds to the 415 Unsupported Media Type error by sending an ACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.5-15: ACK (S-CSCF to P-CSCF)

```
ACK sip:%5b5555%3a%3aeee%3afff%3aaaa%3abb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

16. 415 Unsupported Media Type (S-CSCF to S-CSCF) – see example in table 10.3.5-16

S-CSCF#2 sends the 415 Unsupported Media Type response to S-CSCF#1.

Table 10.3.5-16: 415 Unsupported Media Type (S-CSCF to S-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

17. ACK (S-CSCF to S-CSCF) – see example in table 10.3.5-17

S-CSCF#1 acknowledges the error indication (16) by sending an ACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.3.5-17: ACK (S-CSCF to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

18. 415 Unsupported Media Type (S-CSCF to P-CSCF) – see example in table 10.3.5-18

S-CSCF#1 sends the 415 Unsupported Media Type response to P-CSCF#1.

Table 10.3.5-18: 415 Unsupported Media Type (S-CSCF to P-CSCF)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

19. ACK (P-CSCF to S-CSCF) – see example in table 10.3.5-19

P-CSCF#1 acknowledges the error response (18) by sending an ACK request to S-CSCF#1.

Table 10.3.5-19: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

20. 415 Unsupported Media Type (P-CSCF to UE) – see example in table 10.3.5-16

P-CSCF#1 sends the 415 Unsupported Media Type response to UE#1.

Table 10.3.5-16: 415 Unsupported Media Type (P-CSCF to UE)

```
SIP/2.0 415 Unsupported Media Type
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

21. ACK (UE to P-CSCF) – see example in table 10.3.5-21

UE#1 acknowledges the error response by sending an ACK request to P-CSCF#1.

Table 10.3.5-21: ACK (UE to P-CSCF)

```
ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

10.4 Session redirection procedures

10.4.1 Introduction

This subclause gives signalling flows for the procedures for performing session redirection. The decision to redirect a session to a different destination may be made for different reasons by a number of different functional elements, and at different points in the establishment of the session.

Three cases of session redirection prior to bearer establishment are presented, and one case of session redirection after bearer establishment.

These cases enable the typical services of "Session Forward Unconditional", "Session Forward Busy", "Session Forward Variable", "Selective Session Forwarding", and "Session Forward No Answer", though it is important to recognise that the implementation is significantly different from the counterparts in the CS domain.

10.4.2 Session redirection initiated by S-CSCF to IM CN subsystem (MO#2, MT#2 assumed)

One of the entities in a basic session that may initiate a redirection is the S-CSCF of the destination subscriber. The subscriber profile information obtained from the HSS by the 'Cx-pull' during registration may contain complex logic and triggers causing session redirection. S-CSCF#2 sends the SIP INVITE request to the I-CSCF for the new destination (I-CSCF#F in the figure), who forwards it to S-CSCF#F, who forwards it to the new destination.

In cases when the destination subscriber is not currently registered in the IM CN subsystem, the I-CSCF may assign a temporary S-CSCF to perform the service control on behalf of the intended destination. This temporary S-CSCF takes the role of S-CSCF#2 in figure 10.4.2-1.

The service implemented by figure 10.4.2-1 is typically "Session Forward Unconditional", "Session Forward Variable" or "Selective Session Forwarding". S-CSCF#2 may also make use of knowledge of current sessions in progress at the UE, and implement "Session Forwarding Busy" in this way.

There are 9 distinct signalling flows for this session redirection, as follows:

- Single network operator performing origination, forwarding, and termination.
- One network operator performing origination and forwarding, separate network operator performing termination, with a THIG between to maintain configuration independence.
- One network operator performing origination and forwarding, separate network operator performing termination, without a THIG between.
- One network operator performing origination, second network operator performing forwarding and termination, with a THIG between to maintain configuration independence.
- One network operator performing origination, second network operator performing forwarding and termination, without a THIG between.
- One network operator performing origination, second network operator performing forwarding, and third network operator performing termination, without any THIGs between them.
- One network operator performing origination, second network operator performing forwarding, and third network operator performing termination, with a THIG between first two to maintain configuration independence
- One network operator performing origination, second network operator performing forwarding, and third network operator performing termination, with a THIG between second and third to maintain configuration independence.
- One network operator performing origination, second network operator performing forwarding, and third network operator performing termination, with a THIG between all three to maintain configuration independence.

Further, it is possible that a session will be redirected multiple times, so the above list generalizes to include multiple forwarding elements.

All of these Session-Redirection procedures can be combined with MO#1a, MO#1b, or MO#2 for session origination, and with MT#1a, MT#1b, or MT#2 for session termination.

Only the first case is shown here, with a single network operator performing origination, forwarding, and termination. The additional cases can be derived from the procedures shown here and in S-S#1a, and S-S#1b.

This case is shown in the signalling flow in figure 10.4.2-1.

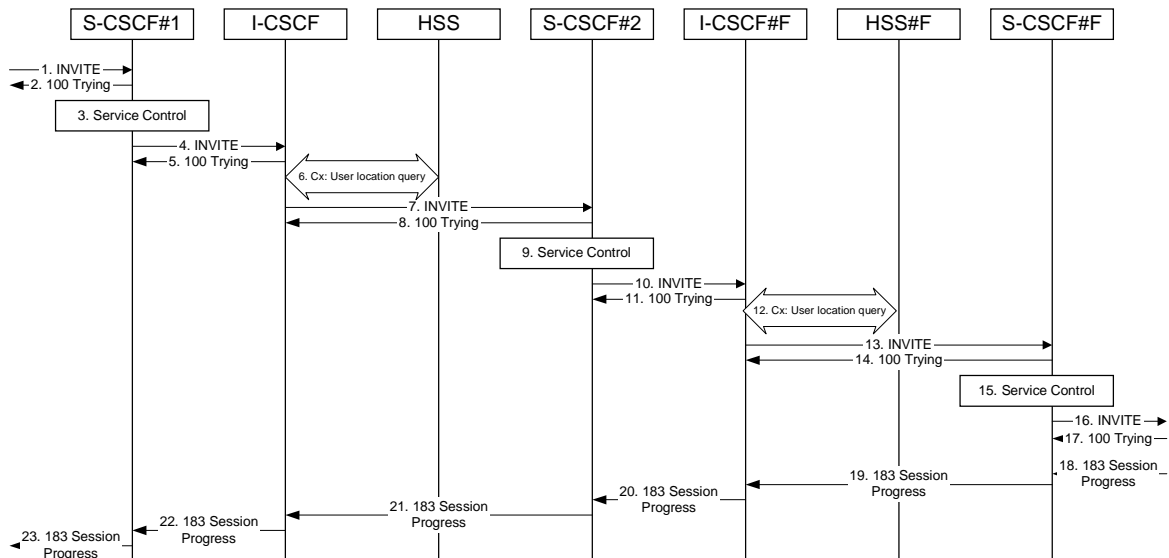


Figure 10.4.2-1: Session redirection initiated by S-CSCF to IM CN subsystem

The IM CN subsystem - Session Redirection Procedure is as follows:

1. INVITE (MO to S-CSCF) – see example in table 10.4.2-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 10.4.2-1: INVITE (MO to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:%5b5555%3a%3aaa%3abbb%3accc%3add%5d@pcscf1.home1.net
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-CSCF to MO) – see example in table 10.4.2-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 10.4.2-2: 100 Trying (S-CSCF to MO)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

4. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.2-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since it is a destination served by the same network operator, S-CSCF#1 forwards the INVITE request directly to I-CSCF in the same network.

Table 10.4.2-4: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-3333@home.net;user=phone SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

5. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.2-5

I-CSCF responds to the INVITE request (4) by sending a 100 Trying provisional response to S-CSCF#1.

Table 10.4.2-5: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 4), which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 7) and sent to S-CSCF.

7. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.2-7

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 10.4.2-7: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

NOTE 1: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

8. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.2-8

S-CSCF#2 responds to the INVITE request (7) with a 100 Trying provisional response.

Table 10.4.2-8: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```


9. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt. Based on some service-specific criterion, S-CSCF#2 decides to redirect this session attempt to a new IM CN subsystem destination, at the URL sip:+1-212-555-3333@home.net;user=phone.

10. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.2-10

S-CSCF#2 performs an analysis of the destination address, and determines the new destination is served by the same network operator. S-CSCF#2 forwards the INVITE request directly to I-CSCF#F (which may be different than I-CSCF#1 consulted earlier).

Table 10.4.2-10: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-3333@home.net;user=phone SIP/2.0
Via: SIP/2.0/UDP sip:scscf2.home2.net, SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

11. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.2-11

I-CSCF responds to the INVITE request (10) by sending a 100 Trying provisional response to S-CSCF#1.

Table 10.4.2-11: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

12. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 10), which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 13) and sent to S-CSCF.

13. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.2-13

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#F) that will handle the session termination.

Table 10.4.2-13: INVITE (I-CSCF to S-CSCF)

```
INVITE sip:scscff.home.net SIP/2.0
Via: SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

NOTE 2: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

14. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.2-14

S-CSCF#2 responds to the INVITE request with a 100 Trying provisional response.

Table 10.4.2-14: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

15. Service Control

S-CSCF#F performs whatever service control is appropriate for this termination session.

16. INVITE (S-CSCF to MT) – see example in table 10.4.2-16

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 10.4.2-16: INVITE (S-CSCF to MT)

```

INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP2.0/UDP scscff.home.net, SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-3333@home.net;user=phone
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

17. 100 Trying (MT to S-CSCF) – see example in table 10.4.2-17

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request, as specified by the termination procedures.

Table 10.4.2-17: 100 Trying (MT to S-S#2)

```

SIP/2.0 100 Trying
Via: SIP2.0/UDP scscff.home.net, SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

18. 183 Session Progress (MT to S-CSCF) – see example in table 10.4.2-18

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response, as per the termination procedure.

Table 10.4.2-18: 183 Session Progress (MT to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscff.home.net, SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-3333>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm

```

19. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 10.4.2-19

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF.

Table 10.4.2-19: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscff.home.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

20. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 10.4.2-20

I-CSCF forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 10.4.2-20: 183 Session Progress (I-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

21. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 10.4.2-21

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF.

Table 10.4.2-21: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-3333>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

22. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 10.4.2-22

I-CSCF forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 10.4.2-22: 183 Session Progress (I-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

23. 183 Session Progress (S-CSCF to MO) – see example in table 10.4.2-23

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 10.4.2-23: 183 Session Progress (S-CSCF to MO)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscff.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=

```

10.4.3 Session redirection initiated by S-CSCF to CS-domain (S-S#2, MT#2 assumed)

The S-CSCF in the scenario above may determine that the session is to be redirected to a CS-domain endpoint, or to the PSTN. It recognizes this situation by the redirected URL being a tel: URL.

For the simplest configuration (Mobile located in home service area (MO#2), initiating a session to a destination served by same network operator(S-S#2)), the handling of redirection to a tel: URL is shown in figure 10.4.3-1. Other cases,

which include roaming, PSTN origination, destinations served by other network operators, and THIGs, are handled in a similar manner.

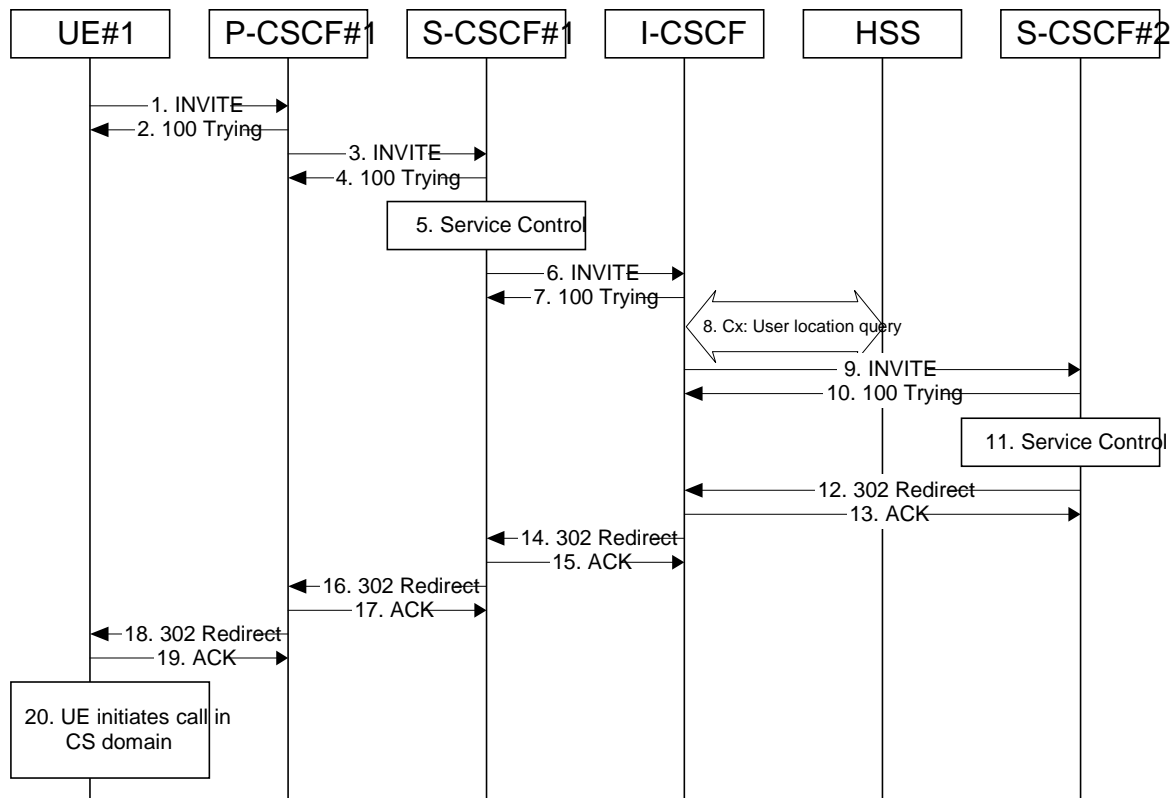


Figure 10.4.3-1: Session redirection initiated by S-CSCF to CS-Domain

Step-by-step processing is as follows:

1. INVITE (UE to P-CSCF) – see example in table 10.4.3-1

UE sends the INVITE request, containing an initial SDP, to the P-CSCF determined via the CSCF discovery mechanism.

Table 10.4.3-1: INVITE (UE to P-CSCF)

```
INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
```

Request-URI:	Contains the keyed number from the user.
Via:	Contains the IP address or FQDN of the originating UE.
Remote-Party-ID:	Contains the public user identity. The Display name is optional.
Proxy-Require:	The sip privacy draft specifies that the usage of the Remote-Party-Id MUST be accompanied by a Proxy-Require header specifying "privacy" in all INVITE requests.
From:/To:/Call-ID:	Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
Cseq:	A random starting number.
Contact:	The IP address or FQDN of the originating UE.

2. 100 Trying (P-CSCF to UE) – see example in table 10.4.3-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 10.4.3-2: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. INVITE (P-CSCF to S-CSCF) – see example in table 10.4.3-3

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes a Route header in the request. This next hop is the S-CSCF within the home network.

P-CSCF rewrites the Contact header, with a locally defined value that identifies the UE. P-CSCF adds itself to the Record-Route header, and adds a Via header.

The INVITE request is forwarded to the S-CSCF.

Table 10.4.3-3: INVITE (P-CSCF to S-CSCF)

```
INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```


Request-URI: The first component in the remembered Path header from Registration.

Route: Contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

4. 100 Trying (S-CSCF to P-CSCF) – see example in table 10.4.3-4

S-CSCF responds to the INVITE request (3) with a 100 Trying provisional response.

Table 10.4.3-4: 100 Trying (S-CSCF to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

5. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

6. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.3-6

S-CSCF forwards the INVITE request, as specified by the S-CSCF to S-CSCF procedures.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 10.4.3-6: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.3-7

S-CSCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 10.4.3-7: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 6), which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 9) and sent to S-CSCF.

9. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.3-9

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 10.4.3-9: INVITE (I-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=09a238.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

NOTE: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

10. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.3-10

S-CSCF#2 responds to the INVITE request with a 100 Trying provisional response.

Table 10.4.3-10: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=09a238.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
```

```

From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt. Based on some service-specific criterion, S-CSCF#2 decides to redirect this session attempt to a CS-domain endpoint, at the URL tel:+1-212-555-3333.

12. 302 Redirect (S-CSCF to I-CSCF) – see example in table 10.4.3-12

S-CSCF#2 sends a 302 Redirect response to I-CSCF, containing the new destination.

Table 10.4.3-12: 302 Redirect (S-CSCF to I-CSCF)

```

SIP/2.0 302 Redirect
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=09a238.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: tel:+1-212-555-3333
Content-Length: 0

```

13. ACK (I-CSCF to S-CSCF) – see example in table 10.4.3-13

I-CSCF acknowledges receipt of the 302 Redirect response by sending an ACK request to S-CSCF#2.

Table 10.4.3-13: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=09a238.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

14. 302 Redirect (I-CSCF to S-CSCF) – see example in table 10.4.3-14

I-CSCF sends a 302 Redirect response to S-CSCF#1, containing the new destination.

Table 10.4.3-14: 302 Redirect (I-CSCF to S-CSCF)

```

SIP/2.0 302 Redirect
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

15. ACK (S-CSCF to I-CSCF) – see example in table 10.4.3-15

S-CSCF#1 acknowledges receipt of the 302 Redirect response by sending an ACK request to I-CSCF.

Table 10.4.3-15: ACK (S-CSCF to I-CSCF)

```

ACK sip:icscf2_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1

```

```
From:  
To:  
Call-ID:  
Cseq:  
Content-Length:
```

16. 302 Redirect (S-CSCF to P-CSCF) – see example in table 10.4.3-16

S-CSCF#1 sends a 302 Redirect response to P-CSCF, containing the new destination.

Table 10.4.3-16: 302 Redirect (S-CSCF to P-CSCF)

```
SIP/2.0 302 Redirect  
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]  
From:  
To:  
Call-ID:  
CSeq:  
Contact:  
Content-Length: 0
```

17. ACK (P-CSCF to S-CSCF) – see example in table 10.4.3-17

P-CSCF acknowledges receipt of the 302 Redirect response by sending an ACK request to S-CSCF#1.

Table 10.4.3-17: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0  
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1  
From:  
To:  
Call-ID:  
Cseq:  
Content-Length:
```

18. 302 Redirect (P-CSCF to UE) – see example in table 10.4.3-18

P-CSCF sends a 302 Redirect response to UE, containing the new destination.

Table 10.4.3-18: 302 Redirect (P-CSCF to UE)

```
SIP/2.0 302 Redirect  
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]  
From:  
To:  
Call-ID:  
CSeq:  
Contact:  
Content-Length: 0
```

19. ACK (UE to P-CSCF) – see example in table 10.4.3-19

UE acknowledges receipt of the 302 Redirect response by sending an ACK request to P-CSCF.

Table 10.4.3-19: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0  
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]  
From:  
To:  
Call-ID:  
Cseq:  
Content-Length:
```

20. UE initiates session in CS domain

UE initiates a session to the new destination given in the Contact header, using mechanisms of the CS domain.

10.4.4 Session redirection initiated by S-CSCF to general endpoint (S-S#2, MT#2 assumed)

The S-CSCF in the scenario above may determine that the session is to be redirected to an endpoint outside the IP MultiMedia System and outside the CS-domain. Examples of these destinations include web pages, email addresses, etc. It recognizes this situation by the redirected URL being other than a sip: or tel: URL.

For the simplest configuration (Mobile located in home service area (MO#2), initiating a session to a destination served by same network operator(S-S#2)), the handling of redirection to a general URL is shown in figure 10.4.4-1. Other cases, which include roaming, PSTN origination, destinations served by other network operators, and THIGs, are handled in a similar manner.

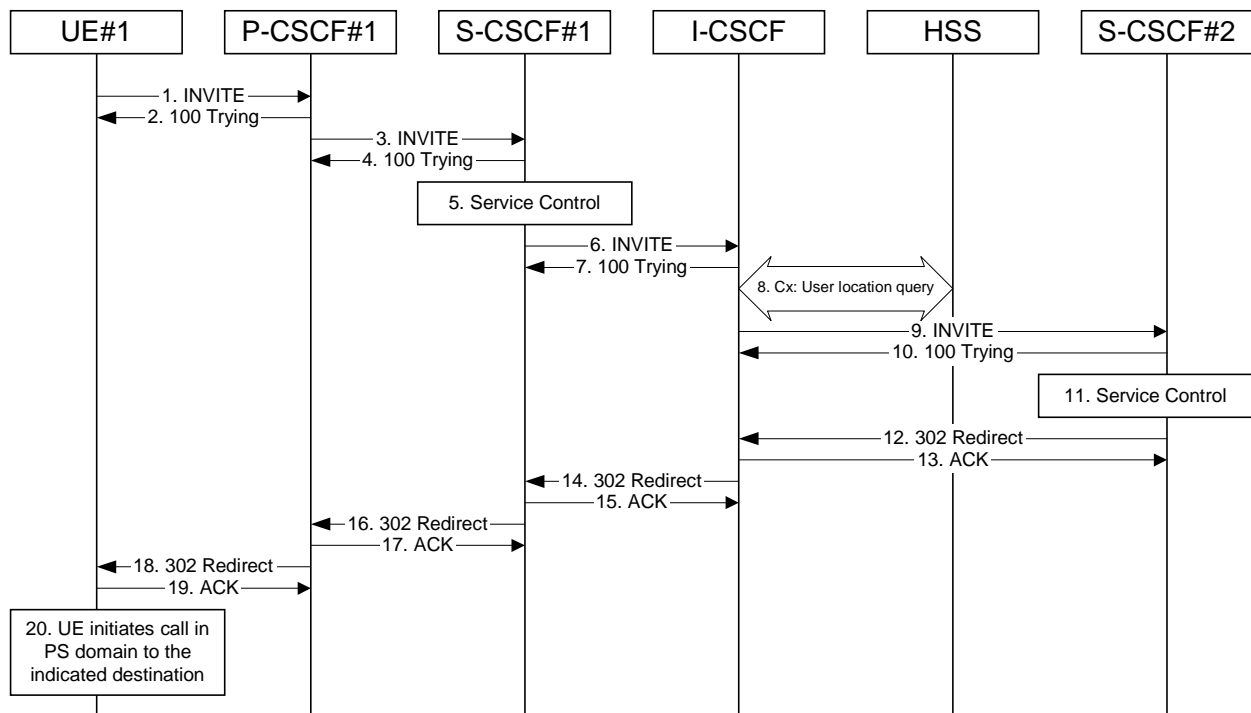


Figure 10.4.4-1: Session redirection initiated by S-CSCF to general endpoint

Step-by-step processing is as follows:

1. INVITE (UE to P-CSCF) – see example in table 10.4.4-1

UE sends the INVITE request, containing an initial SDP, to the P-CSCF determined via the CSCF discovery mechanism.

Table 10.4.4-1: INVITE (UE to P-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
```

- Request-URI:** Contains the keyed number from the user.
- Via:** Contains the IP address or FQDN of the originating UE.
- Remote-Party-ID:** Contains the public user identity. The Display name is optional.
- Proxy-Require:** The sip privacy draft specifies that the usage of the Remote-Party-Id MUST be accompanied by a Proxy-Require header specifying "privacy" in all INVITE requests.
- From:/To:/Call-ID:** Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
- Cseq:** A random starting number.
- Contact:** The IP address or FQDN of the originating UE.

2. 100 Trying (P-CSCF to UE) – see example in table 10.4.4-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 10.4.4-2: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. INVITE (P-CSCF to S-CSCF) – see example in table 10.4.4-3

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes a Route header in the request. This next hop is the S-CSCF within the home network.

P-CSCF rewrites the Contact header, with a locally defined value that identifies the UE. P-CSCF adds itself to the Record-Route header, and adds a Via header.

The INVITE request is forwarded to the S-CSCF.

Table 10.4.4-3: INVITE (P-CSCF to S-CSCF)

```
INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Type:
Content-Length:
```

```
v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

Request-URI: The first component in the remembered Path header from Registration.

Route: Contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

4. 100 Trying (S-CSCF to P-CSCF) – see example in table 10.4.4-4

S-CSCF responds to the INVITE request (3) with a 100 Trying provisional response.

Table 10.4.4-4: 100 Trying (S-CSCF to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

5. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

6. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.4-6

S-CSCF forwards the INVITE request, as specified by the S-CSCF to S-CSCF procedures.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 10.4.4-6: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

a=

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.4-7

S-CSCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 10.4.4-7: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 6), which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 9) and sent to S-CSCF.

9. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.4-9

I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 10.4.4-9: INVITE (I-CSCF to S-CSCF)

```
INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```


NOTE: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

10. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.4-10

S-CSCF#2 responds to the INVITE request with a 100 Trying provisional response.

Table 10.4.4-10: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

11. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt. Based on some service-specific criterion, S-CSCF#2 decides to redirect this session attempt to a PS-domain endpoint, at the URL `mailto:alienblaster@home.net`.

12. 302 Redirect (S-CSCF to I-CSCF) – see example in table 10.4.4-12

S-CSCF#2 sends a 302 Redirect response to I-CSCF, containing the new destination.

Table 10.4.4-12: 302 Redirect (S-CSCF to I-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: mailto:alienblaster@home.net
Content-Length: 0
```

13. ACK (I-CSCF to S-CSCF) – see example in table 10.4.4-13

I-CSCF acknowledges receipt of the 302 Redirect response by sending an ACK request to S-CSCF#2.

Table 10.4.4-13: ACK (I-CSCF to S-CSCF)

```
ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:
```

14. 302 Redirect (I-CSCF to S-CSCF) – see example in table 10.4.4-14

I-CSCF sends a 302 Redirect response to S-CSCF#1, containing the new destination.

Table 10.4.4-14: 302 Redirect (I-CSCF to S-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
```

```
Call-ID:  
CSeq:  
Contact:  
Content-Length: 0
```

15. ACK (S-CSCF to I-CSCF) – see example in table 10.4.4-15

S-CSCF#1 acknowledges receipt of the 302 Redirect response by sending an ACK request to I-CSCF.

Table 10.4.4-15: ACK (S-CSCF to I-CSCF)

```
ACK sip:icscf2_s.home1.net SIP/2.0  
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1  
From:  
To:  
Call-ID:  
Cseq:  
Content-Length:
```

16. 302 Redirect (S-CSCF to P-CSCF) – see example in table 10.4.4-16

S-CSCF#1 sends a 302 Redirect response to P-CSCF, containing the new destination.

Table 10.4.4-16: 302 Redirect (S-CSCF to P-CSCF)

```
SIP/2.0 302 Redirect  
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]  
From:  
To:  
Call-ID:  
CSeq:  
Contact:  
Content-Length: 0
```

17. ACK (P-CSCF to S-CSCF) – see example in table 10.4.4-17

P-CSCF acknowledges receipt of the 302 Redirect response by sending an ACK request to S-CSCF#1.

Table 10.4.4-17: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0  
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1  
From:  
To:  
Call-ID:  
Cseq:  
Content-Length:
```

18. 302 Redirect (P-CSCF to UE) – see example in table 10.4.4-18

P-CSCF sends a 302 Redirect response to UE, containing the new destination.

Table 10.4.4-18: 302 Redirect (P-CSCF to UE)

```
SIP/2.0 302 Redirect  
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]  
From:  
To:  
Call-ID:  
CSeq:  
Contact:  
Content-Length: 0
```

19. ACK (UE to P-CSCF) – see example in table 10.4.4-19

UE acknowledges receipt of the 302 Redirect response by sending an ACK request to P-CSCF.

Table 10.4.4-19: ACK (UE to P-CSCF)

```

ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
    
```

20. UE initiates session in PS domain

UE initiates a session to the new destination given in the Contact header, using mechanisms of the PS domain.

10.4.5 Session redirection initiated by P-CSCF (S-S#2, MT#2 assumed)

One of the entities in a basic session that may initiate a redirection is the P-CSCF of the destination subscriber. In handling of an incoming session setup attempt, the P-CSCF normally sends the INVITE request to the destination UE, and retransmits it as necessary until obtaining an acknowledgement indicating reception by the UE.

In cases when the destination subscriber is not currently reachable in the IM CN subsystem (due to such factors as roaming outside the service area or loss of battery, but the registration has not yet expired), the P-CSCF may initiate a redirection of the session. The P-CSCF informs the S-CSCF of this redirection, without specifying the new location; S-CSCF determines the new destination and performs according to subclauses 10.4.2, 10.4.3, or 10.4.4, based on the type of destination.

This is shown in figure 10.4.5-1.

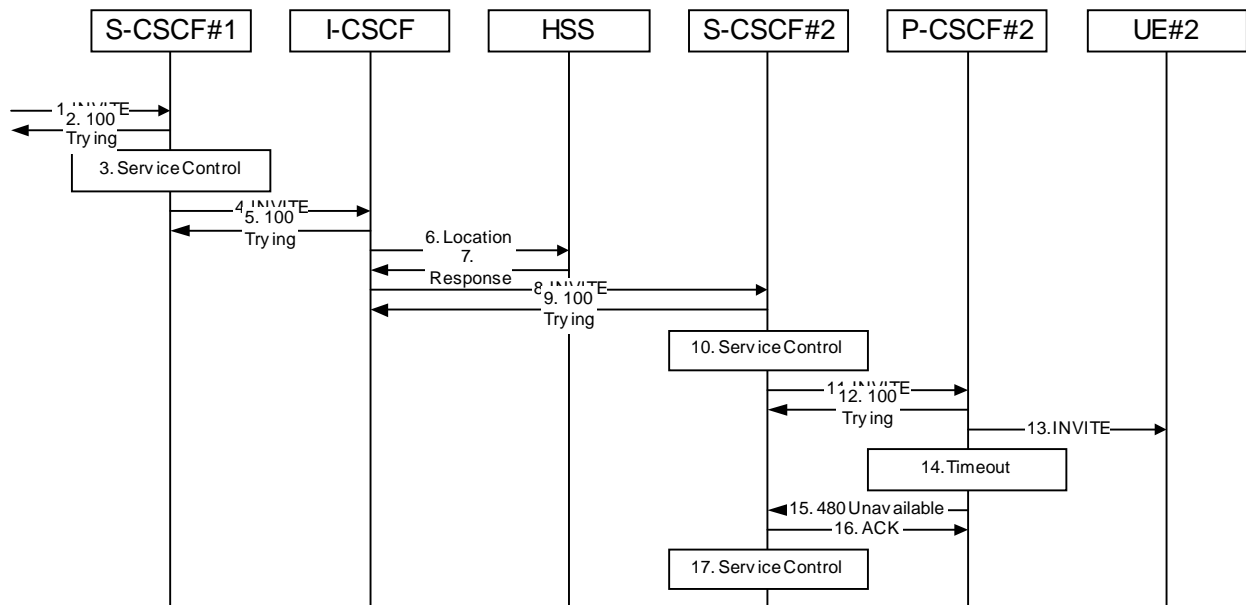


Figure 10.4.5-1: Session redirection initiated by P-CSCF

Beginning with step #8, the step-by-step processing is as follows:

8. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.5-8

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 10.4.5-8: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

9. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.5-9

S-CSCF responds to the INVITE request (8) with a 100 Trying provisional response.

Table 10.4.5-9: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

10. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

11. INVITE (S-CSCF to P-CSCF) – see example in table 10.4.5-11

S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

Table 10.4.5-11: INVITE (S-CSCF to P-CSCF)

```

INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Route: Built from the registration information, (pcscf and UE contact name), followed by the initial Request-URI from the incoming INVITE request. The first component of the Route header, pcscf, is moved to the Request-URI of the request.

Via/Record-Route: S-CSCF adds itself in the Record-Route and Via headers.

12. 100 Trying (P-CSCF to S-CSCF) – see example in table 10.4.5-12

P-CSCF responds to the INVITE request (11) with a 100 Trying provisional response.

Table 10.4.5-12: 100 Trying (P-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

13. INVITE (P-CSCF to UE) – see example in table 10.4.5-13

P-CSCF determines the UE address from the value of the Request-URI (which was previously returned by P-CSCF as a contact header value in the registration procedure), and forwards the INVITE request to the UE.

Table 10.4.5-13: INVITE (P-CSCF to UE)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=token1
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact: token1@pcscf2.home1.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
sip:%5b5555%3a%3aaaa%3abbb%3accc%3addd%5d@pcscf1.home1.net

```

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token.

14. Timeout

P-CSCF never receives any response from UE#2, and assumes it is unreachable.

15. 480 Temporarily Unavailable (P-CSCF to S-CSCF) – see example in table 10.4.5-15

P-CSCF sends a 480 Temporarily Unavailable response to S-CSCF.

Table 10.4.5-15: 480 Temporarily Unavailable (P-CSCF to S-CSCF)

```

SIP/2.0 480 Temporarily Unavailable
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

16. ACK (S-CSCF to P-CSCF) – see example in table 10.4.5-16

S-CSCF acknowledges receipt of the 480 Temporarily Unavailable response (15) by sending an ACK request to P-CSCF.

Table 10.4.5-16: ACK (S-CSCF to P-CSCF)

```

ACK sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
Cseq:
Content-Length:
    
```

17. Service Control

S-CSCF#2 determines the proper redirection action to take for this session, based on the subscriber profile and network operator policy.

- If the session is being redirected to a sip URL, then the signalling flow continues with step #11 of subclause 10.4.2.
- If the session is being redirected to a tel URL, then the signalling flow continues with step #13 of subclause 10.4.3.
- If the session is being redirected to a general URL, then the signalling flow continues with step #13 of subclause 10.4.4.

10.4.6 Session redirection initiated by UE (S-S#2, MT#2 assumed)

The next entity in a basic session that may initiate a redirection is the UE of the destination subscriber. The UE may implement customer-specific feature processing, and base its decision to redirect this session on such things as identity of caller, current sessions in progress, other applications currently being accessed, etc. UE sends the SIP Redirect response to its P-CSCF, who forwards back along the signalling path to S-CSCF#1, who initiates a session to the new destination.

The service implemented by this signalling flow is typically "Session Forward Busy", "Session Forward Variable" or "Selective Session Forwarding".

This is shown in figure 10.4.6-1.

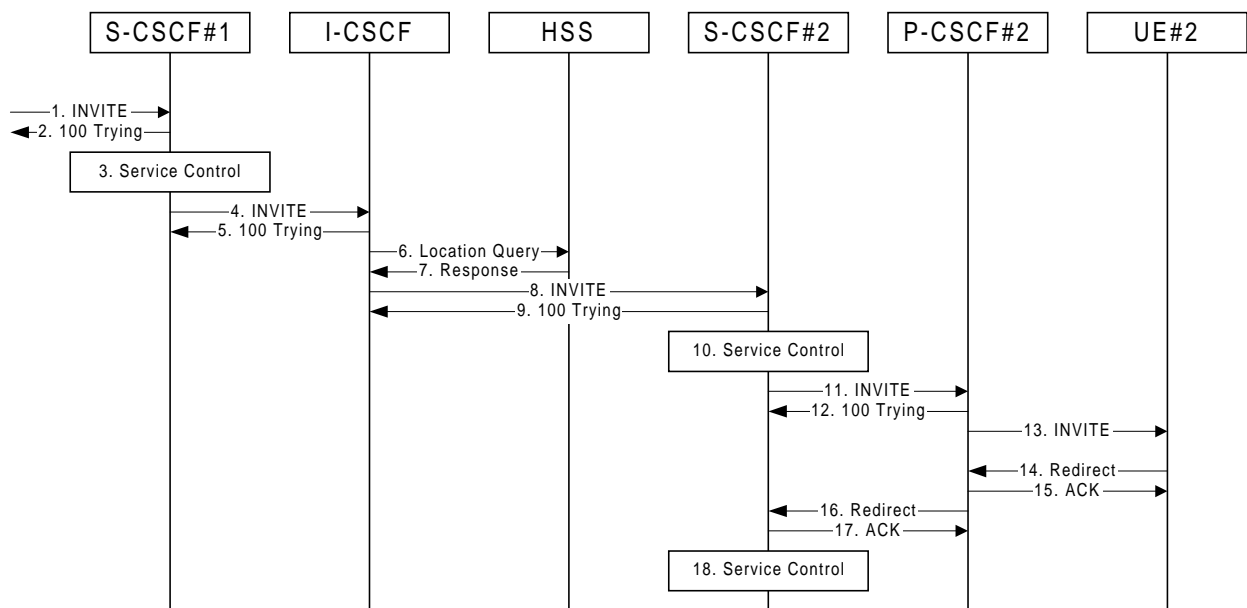


Figure 10.4.6-1: Session redirection initiated by UE

Beginning with step #8, the step-by-step processing is as follows:

8. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.6-8

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 10.4.6-8: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

9. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.6-9

S-CSCF responds to the INVITE request (8) with a 100 Trying provisional response.

Table 10.4.6-9: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

10. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

11. INVITE (S-CSCF to P-CSCF) – see example in table 10.4.6-11

S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

Table 10.4.6-11: INVITE (S-CSCF to P-CSCF)

```

INVITE sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=492e09.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:492e09.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Route: Built from the registration information, (pcscf and UE contact name), followed by the initial Request-URI from the incoming INVITE request. The first component of the Route header, pcscf, is moved to the Request-URI of the request.

Via/Record-Route: S-CSCF adds itself in the Record-Route and Via headers.

12. 100 Trying (P-CSCF to S-CSCF) – see example in table 10.4.6-12

P-CSCF responds to the INVITE request (11) with a 100 Trying provisional response.

Table 10.4.6-12: 100 Trying (P-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=492e09.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

13. INVITE (P-CSCF to UE) – see example in table 10.4.6-13

P-CSCF determines the UE address from the value of the Request-URI (which was previously returned by P-CSCF as a contact header value in the registration procedure), and forwards the INVITE request to the UE.

Table 10.4.6-13: INVITE (P-CSCF to UE)

```

INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=39z58a.1
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:492e09.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
      sip:431h23.1@pcscf1.home1.net

```

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token.

14. 302 Redirect (UE to P-CSCF) – see example in table 10.4.6-14

UE sends a 302 Redirect response to UE, specifying a new destination.

Table 10.4.6-14: 302 Redirect (UE to P-CSCF)

```

SIP/2.0 302 Redirect
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:+1-212-555-3333@home1.net;user=phone
Content-Length: 0

```

15. ACK (P-CSCF to UE) – see example in table 10.4.6-15

S-CSCF acknowledges receipt of the 302 Redirect response (15) by sending an ACK request to P-CSCF.

Table 10.4.6-15: ACK (P-CSCF to UE)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=39z58a.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

16. 302 Redirect (P-CSCF to S-CSCF) – see example in table 10.4.6-16

P-CSCF sends a 302 Redirect response to S-CSCF, with the new destination.

Table 10.4.6-16: 302 Redirect (P-CSCF to S-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP scscf2.home1.net;branch=492e09.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

17. ACK (S-CSCF to P-CSCF) – see example in table 10.4.6-17

S-CSCF acknowledges receipt of the 302 Redirect response (16) by sending an ACK request to P-CSCF.

Table 10.4.6-17: ACK (S-CSCF to P-CSCF)

```
ACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

18. Service Control

S-CSCF#2 determines the proper redirection action to take for this session, based on the subscriber profile and network operator policy.

- If the session is being redirected to a sip URL, then the signalling flow continues with step #11 of subclause 10.4.2.
- If the session is being redirected to a tel URL, then the signalling flow continues with step #13 of subclause 10.4.3.
- If the session is being redirected to a general URL, then the signalling flow continues with step #13 of subclause 10.4.4.

10.4.7 Session redirection initiated after bearer establishment

The UE of the destination subscriber may request the session be redirected after a customer-specified ringing interval. The UE may also implement customer-specific feature processing, and base its decision to redirect this session on such things as the identity of caller, current sessions in progress, other applications currently being accessed, etc. The UE sends the SIP Redirect response to its P-CSCF, who forwards back along the signalling path to the originating endpoint, who initiates a session to the new destination.

The service implemented by this signalling flow is typically "Session Forward No Answer".

Redirection to another I CN subsystem endpoint (e.g. a sip: URL) is shown in figure 10.4.7-1. The figure starts at the point in the session establishment when the destination is known, resources have been reserved, and the destination subscriber is being alerted. If the desire for redirection was known earlier than this point, the procedures of Subclause 10.4.6 would be followed instead.

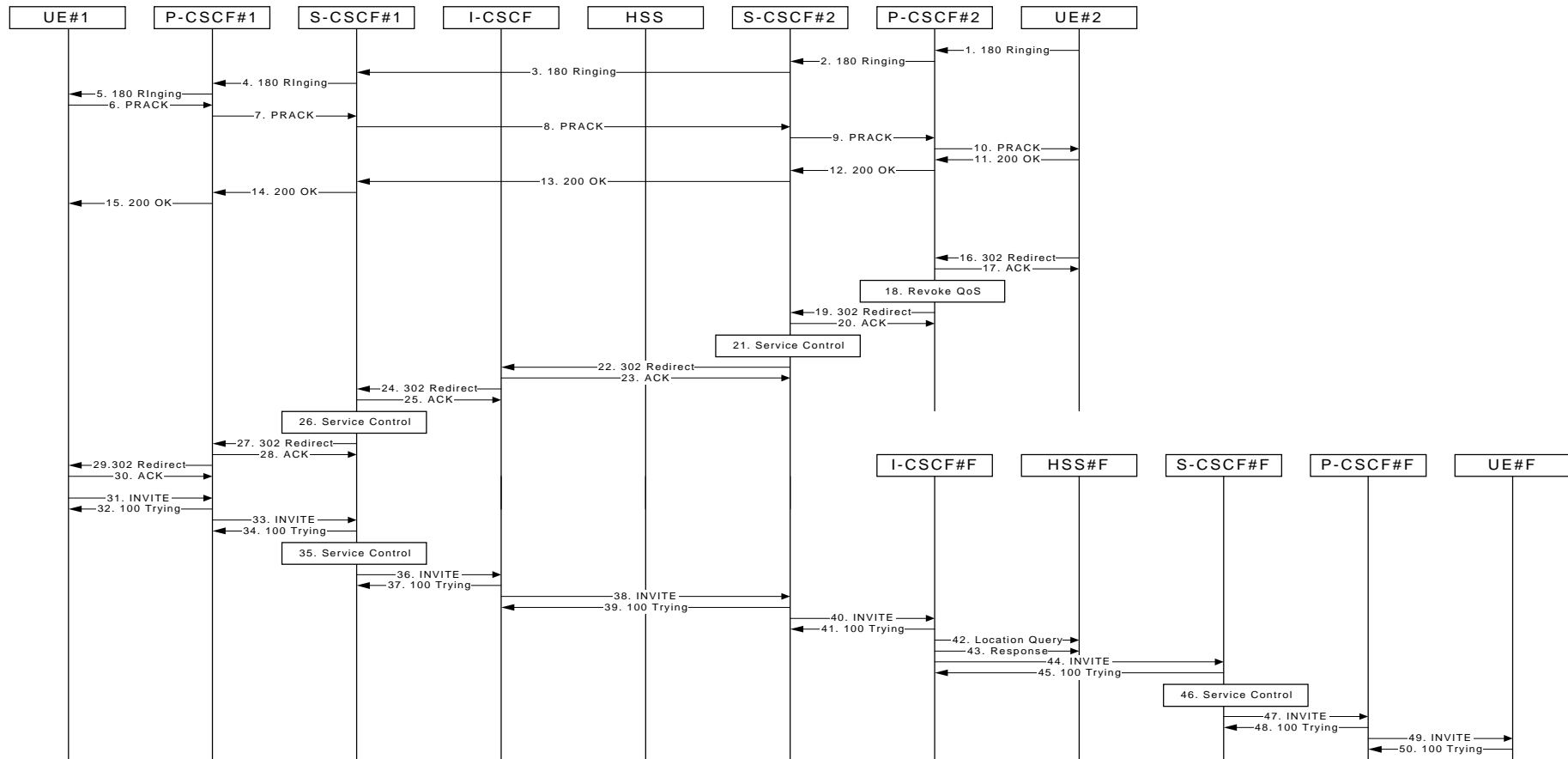


Figure 10.4.7-1: Session redirection after bearer establishment

Step-by-step processing is as follows:

1. **180 Ringing (UE to P-CSCF) – see example in table 10.4.7-1**

Depending on the type of codec change being performed, alerting may be required at the destination UE. If so, UE#2 sends a 180 Ringing provisional response to the originator, through P-CSCF#2.

Table 10.4.7-1: 180 Ringing (UE to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.home1.net;branch=token3
Require: 100rel
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 19
Content-Length: 0
```

2. **180 Ringing (P-CSCF to S-CSCF) – see example in table 10.4.7-2**

P-CSCF#2 sends the 180 Ringing response to S-CSCF#2.

Table 10.4.7-2: 180 Ringing (P-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

3. **180 Ringing (S-CSCF to S-CSCF) – see example in table 10.4.7-3**

S-CSCF#2 sends the 180 Ringing response to S-CSCF#1.

Table 10.4.7-3: 180 Ringing (S-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

4. **180 Ringing (S-CSCF to P-CSCF) – see example in table 10.4.7-4**

S-CSCF#1 sends the 180 Ringing response to P-CSCF#1.

Table 10.4.7-4: 180 Ringing (S-CSCF to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

5. 180 Ringing (P-CSCF to UE) – see example in table 10.4.7-5

P-CSCF#1 sends the 180 Ringing response to UE#1.

Table 10.4.7-5: 180 Ringing (P-CSCF to UE)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:token4@pcscf1.home1.net
RSeq:
Content-Length:
```

6. PRACK (UE to P-CSCF) – see example in table 10.4.7-6

UE#1 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.4.7-6: PRACK (UE to P-CSCF)

```
PRACK sip:token4@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfg1kj490333
Cseq: 130 PRACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Rack: 19 131 INVITE
Content-Length: 0
```

- Request-URI:** Takes the value of the Contact header of the 180 Ringing response.
- Via:, Contact:** Take the value of either the IP address or FQDN of the UE.
- From:/To:/Call-ID:** Copied from the 180 Ringing response so that they include any revised tag parameters.
- Cseq:** Takes a higher value than in the previous request.

7. PRACK (P-CSCF to S-CSCF) – see example in table 10.4.7-7

P-CSCF#1 sends the PRACK request to S-CSCF#1, along the signalling path established by the INVITE request.

Table 10.4.7-7: PRACK (P-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:scscf2.home1.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home1.net
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Rack:
Content-Length:

```

Route: P-CSCF adds a Route header, with the saved value from the previous response. P-CSCF identifies the proper saved value by the Request-URI.

8. PRACK (S-CSCF to S-CSCF) – see example in table 10.4.7-8

S-CSCF#1 sends the PRACK request to S-CSCF#2, along the signalling path established by the INVITE request.

Table 10.4.7-8: PRACK (S-CSCF to S-CSCF)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home1.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:

```

9. PRACK (S-CSCF to P-CSCF) – see example in table 10.4.7-9

S-CSCF#2 sends the PRACK request to P-CSCF#2, along the signalling path established by the INVITE request.

Table 10.4.7-9: PRACK (S-CSCF to P-CSCF)

```

PRACK sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:

```

10. PRACK (P-CSCF to UE) – see example in table 10.4.7-10

P-CSCF#2 sends the PRACK request to UE#2, along the signalling path established by the INVITE request.

Table 10.4.7-10: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=token4
From:
To:
Call-ID:
Cseq:
Contact: token4@pcscf2.home1.net
Rack:
Content-Length:

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information.

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

11. 200 OK (UE to P-CSCF) – see example in table 10.4.7-11

UE#2 responds to the PRACK request (10) with a 200 OK response to P-CSCF#2.

Table 10.4.7-11: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home1.net;branch=token4
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

12. 200 OK (P-CSCF to S-CSCF) – see example in table 10.4.7-12

P-CSCF#2 sends the 200 OK response to S-CSCF#2.

Table 10.4.7-12: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:

```

13. 200 OK (S-CSCF to S-CSCF) – see example in table 10.4.7-13

S-CSCF#2 sends the 200 OK response to S-CSCF#1.

Table 10.4.7-13: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:

```

14. 200 OK (S-CSCF to P-CSCF) – see example in table 10.4.7-14

S-CSCF#1 sends the 200 OK response to P-CSCF#1.

Table 10.4.7-14: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

15. 200 OK (P-CSCF to UE) – see example in table 10.4.7-15

P-CSCF#1 sends the 200 OK response to UE#1.

Table 10.4.7-15: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:token5@pcscf1.home1.net
Content-Length:
```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

Contact: A locally unique token to identify the saved routing information

16. 302 Redirect (UE to P-CSCF) – see example in table 10.4.7-16

Based on some service criterion, such as a timeout value, UE#2 decides to redirect this session request to another destination. UE#2 sends a 302 Redirect response to P-CSCF, containing the new destination. For this example, consider the new destination to be <sip:+1-212-555-3333@home.net;user=phone>.

Table 10.4.7-16: 302 Redirect (S-CSCF to I-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP pcscf2.home1.net, SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP icscf2_s.home1.net,
SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:+1-212-555-3333@home.net;user=phone
Content-Length: 0
```

17. ACK (P-CSCF to UE) – see example in table 10.4.7-17

P-CSCF acknowledges receipt of the 302 Redirect response (16) by sending an ACK request to UE#2.

Table 10.4.7-17: ACK (I-CSCF to S-CSCF)

```
ACK sip:+1-212-555-2222@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:
```

18. Revoke QoS

P-CSCF revokes any authorization is had made for Quality of Service for this session.

19. 302 Redirect (P-CSCF to S-CSCF) – see example in table 10.4.7-19

P-CSCF#2 sends a 302 Redirect response to S-CSCF#2, containing the new destination.

Table 10.4.7-19: 302 Redirect (P-CSCF to S-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

20. ACK (S-CSCF to P-CSCF) – see example in table 10.4.7-20

S-CSCF acknowledges receipt of the 302 Redirect response (19) by sending an ACK request to P-CSCF#2.

Table 10.4.7-20: ACK (S-CSCF to P-CSCF)

```
ACK sip:pcscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:
```

21. Service Control

S-CSCF#2 performs whatever service control is appropriate for this redirected session.

If UE#2 has not subscribed to a session redirection service, then S-CSCF#2 may change the error response to a 480 Temporarily Unavailable.

S-CSCF#2 generates a private URL containing the new destination, and places this new value as the Contact header in the response. Attempts to initiate a session to this destination shall be restricted to a short time period.

22. 302 Redirect (S-CSCF to I-CSCF) – see example in table 10.4.7-22

S-CSCF#2 sends a 302 Redirect response to I-CSCF, containing the updated destination.

Table 10.4.7-22: 302 Redirect (S-CSCF to I-CSCF)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:Token(+1-212-555-3333@home.net;user=phone)@scscf2.home1.net
Content-Length:
```

23. ACK (I-CSCF to S-CSCF) – see example in table 10.4.7-23

I-CSCF acknowledges receipt of the 302 Redirect response (22) by sending an ACK request to S-CSCF#2.

Table 10.4.7-23: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net
From:
To:
Call-ID:
Cseq:
Content-Length:

```

24. 302 Redirect (I-CSCF to S-CSCF) – see example in table 10.4.7-24

I-CSCF may (based on operator preferences) update the new destination address, in order to hide the S-CSCF address and maintain configuration independence. If so, it generates a new private URL with its own hostname. I-CSCF sends a 302 Redirect response to S-CSCF#1, containing the new destination.

Table 10.4.7-24: 302 Redirect (I-CSCF to S-CSCF)

```

SIP/2.0 302 Redirect
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact: sip:Token(token(sip:+1-212-555-
3333@home.net;user=phone)@scscf2.home1.net;user=private)@icscf2_s.home1.net;user=private
Content-Length: 0

```

25. ACK (S-CSCF to I-CSCF) – see example in table 10.4.7-25

S-CSCF#1 acknowledges receipt of the 302 Redirect response (24) by sending an ACK request to I-CSCF.

Table 10.4.7-25: ACK (S-CSCF to I-CSCF)

```

ACK sip:icscf2_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

26. Service Control

S-CSCF#1 performs whatever service control is appropriate for this redirected session.

27. 302 Redirect (S-CSCF to P-CSCF) – see example in table 10.4.7-27

S-CSCF#1 sends a 302 Redirect response to P-CSCF, containing the new destination.

Table 10.4.7-27: 302 Redirect (S-CSCF to P-CSCF)

```

SIP/2.0 302 Redirect
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

28. ACK (P-CSCF to S-CSCF) – see example in table 10.4.7-28

P-CSCF acknowledges receipt of the 302 Redirect response (27) by sending an ACK request to S-CSCF#1.

Table 10.4.7-28: ACK (P-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

29. 302 Redirect (P-CSCF to UE) – see example in table 10.4.7-29

P-CSCF sends a 302 Redirect response to UE, containing the new destination.

Table 10.4.7-29: 302 Redirect (P-CSCF to UE)

```
SIP/2.0 302 Redirect
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0
```

30. ACK (UE to P-CSCF) – see example in table 10.4.7-30

UE acknowledges receipt of the 302 Redirect response (29) by sending an ACK request to P-CSCF.

Table 10.4.7-30: ACK (UE to P-CSCF)

```
ACK sip:token6@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

31. INVITE (UE to P-CSCF) – see example in table 10.4.7-31

UE sends the INVITE request, containing an initial SDP and the new destination, to the P-CSCF determined via the CSCF discovery mechanism.

Table 10.4.7-31: INVITE (UE to P-CSCF)

```

INVITE sip:Token(token(sip:+1-212-555-
  3333@home.net;user=phone)@scscf2.home1.net;user=private)@icscf2_s.home1.net;user=private SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
  seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

- Request-URI:** Contains the keyed number from the user.
- Via:** Contains the IP address or FQDN of the originating UE.
- Remote-Party-ID:** Contains the public user identity. The Display name is optional.
- Proxy-Require:** The sip privacy draft specifies that the usage of the Remote-Party-Id MUST be accompanied by a Proxy-Require header specifying "privacy" in all INVITE requests.
- From:/To:/Call-ID:** Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
- Cseq:** A random starting number.
- Contact:** The IP address or FQDN of the originating UE.

32. 100 Trying (P-CSCF to UE) – see example in table 10.4.7-32

P-CSCF responds to the INVITE request (31) with a 100 Trying provisional response.

Table 10.4.7-32: 100 Trying (P-CSCF to UE)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

33. INVITE (P-CSCF to S-CSCF) – see example in table 10.4.7-33

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes a Route header in the request. This next hop is the S-CSCF within the home network.

P-CSCF rewrites the Contact header, with a locally defined value that identifies the UE. P-CSCF adds itself to the Record-Route header, and adds a Via header.

The INVITE request is forwarded to the S-CSCF.

Table 10.4.7-33: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(token(sip:+1-212-555-
      3333@home.net;user=phone))@scscf2.home1.net;user=private)@icscf2_s.home1.net;user=private
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

Request-URI: The first component in the remembered Path header from Registration.

Route: Contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

SDP The set of media flows described by the SDP may be reduced based on operator policy, or due to lack of authority of the subscriber to request such a media flow. Procedures are described in subclause 10.3.5.

34. 100 Trying (S-CSCF to P-CSCF) – see example in table 10.4.7-34

S-CSCF responds to the INVITE request (33) with a 100 Trying provisional response.

Table 10.4.7-34: 100 Trying (S-CSCF to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

35. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

36. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.7-36

S-CSCF forwards the INVITE request to the I-CSCF specified in the destination URL.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 10.4.7-36: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:Token(token(sip:+1-212-555-
3333@home.net;user=phone)@scscf2.home1.net;user=private)@icscf2_s.home1.net;user=private SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Request-URI: This is the private URL obtained from the previous 302 Redirect response, which identifies the I-CSCF that must first translate the destination (then the S-CSCF that must further translate the destination). It was copied from the Route header of the incoming request to S-CSCF#1.

SDP: The set of media flows described by the SDP may be reduced based on operator policy, or due to lack of authority of the subscriber to request such a media flow. Procedures are described in subclause 10.3.1.

37. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.7-37

I-CSCF responds to the INVITE request (36) with a 100 Trying provisional response.

Table 10.4.7-37: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

38. INVITE (I-CSCF to S-CSCF) – see example in table 10.4.7-38

I-CSCF translates the private portion of the URL, and determines the destination is S-CSCF2. I-CSCF forwards the INVITE request to the S-CSCF#2 that will further translate the destination.

Table 10.4.7-38: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:Token(+1-212-555-3333@home.net;user=phone)@scscf2.home1.net;user=private SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

39. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.4.7-39

S-CSCF#2 responds to the INVITE request (38) with a 100 Trying provisional response.

Table 10.4.7-39: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

40. INVITE (S-CSCF to I-CSCF) – see example in table 10.4.7-40

S-CSCF translates the private portion of the URL, and determines the destination address. S-CSCF forwards the INVITE request to the I-CSCF#F, the entry point to the destination operator's network.

Table 10.4.7-40: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-3333@home.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

41.100 Trying (I-CSCF to S-CSCF) – see example in table 10.4.7-41

I-CSCF#F responds to the INVITE request (40) with a 100 Trying provisional response.

Table 10.4.7-41: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net, SIP/2.0/UDP icscf2_s.home1.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

The remainder of this session completes as shown in clause 8.

10.5 Session transfer procedures

10.5.1 Introduction

This subclause gives signalling flows for the procedures for performing session transfers. subclause 10.5.2 gives the procedures for a transfer that initiates a new session (i.e. to a new destination not previously involved in the session) while the transferor and the transferee do not remain in the same network. subclause 10.5.3 gives the procedures for a transfer that replaces an existing session (i.e. to a destination that was previously involved in the session) while the transferor and the transferee remain in the same network.

10.5.2 Session Transfer initiating a new session

An IM session already exists between UE#1 and UE#2. UE#2 desires UE#1 to initiate a new session to a new destination, UE#3, and terminate the existing session. The procedures for this transfer are shown in figure 10.5.2-1.

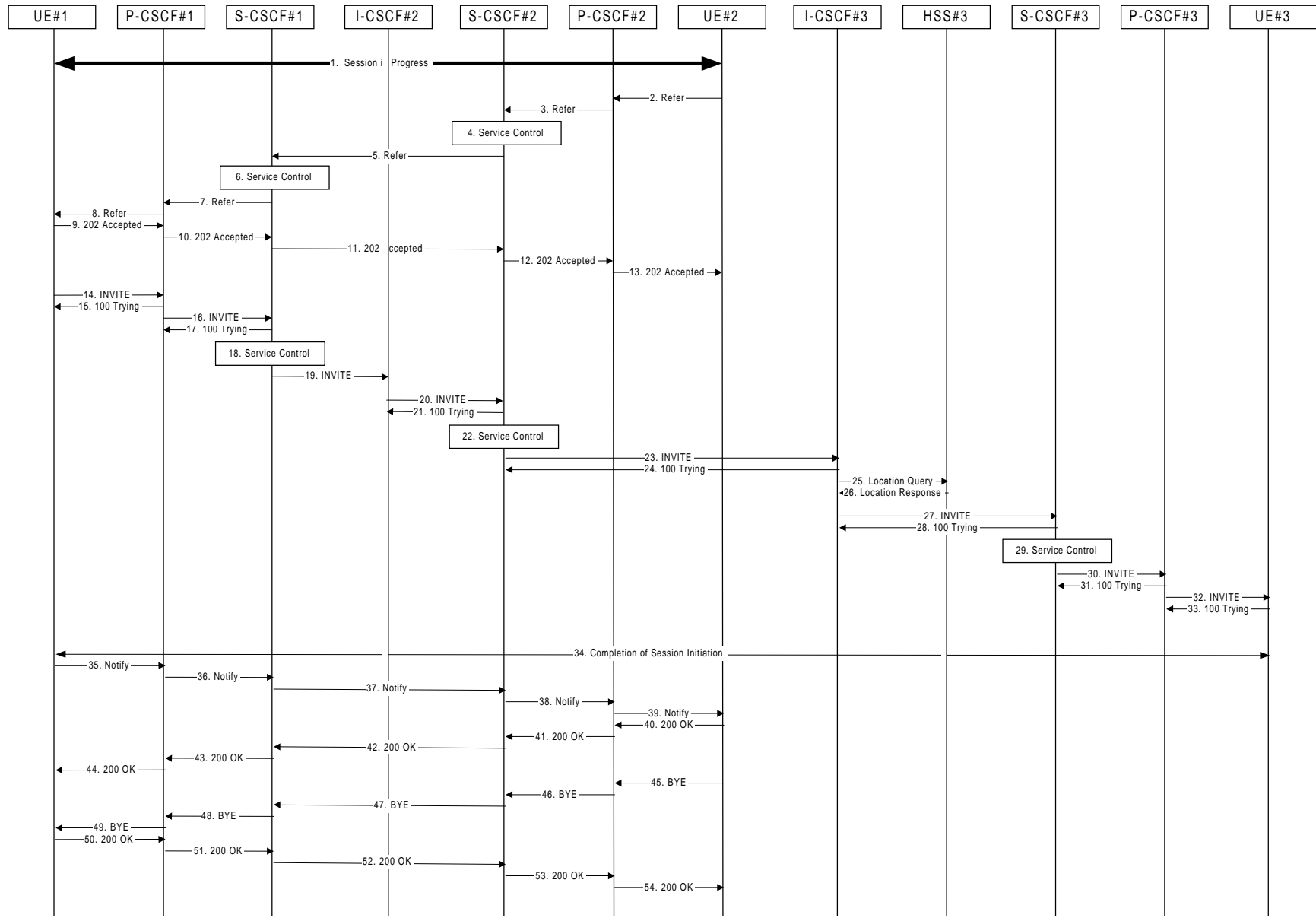


Figure 10.5.2-1: Session Transfer initiating a new session

1. Session in Progress

UE#1 initiates a multi-media session with UE#2. As a result, the state information stored at P-CSCF#2 is shown in table 10.5.2-1.

Table 10.5.2-1: State Information

```
Request-URI: sip:[5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
```

2. REFER (UE to P-CSCF) – see example in table 10.5.2-2

UE#2 sends a Refer request to its proxy, P-CSCF#2.

Table 10.5.2-2: REFER (UE to P-CSCF)

```
REFER sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
To: "Alien Blaster" <sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 REFER
Contact: sip:[5555::eee:fff:aaa:bbb]
Refer-To: sip:user3_public3@home3.net
Referred-By: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Content-Length: 0
```

Request-URI:	Contains the value of the Contact header from the 200-OK response to the initial INVITE.
Via:	Contains the IP address or FQDN of the originating UE.
From:/To:/Call-ID:	Contain the values previously used to establish the session, including the tag value from the response.
Cseq:	Next higher sequential value.
Contact:	The IP address or FQDN of the originating UE.

Editor's Note: Use of Remote-Party-ID in REFER is FFS.

Editor's Note: The proper value for the Referred-By header is FFS.

3. REFER (P-CSCF to S-CSCF) – see example in table 10.5.2-3

P-CSCF adds a Route header, with the saved value corresponding to the session.

P-CSCF#2 forwards the Refer request to S-CSCF#2.

Table 10.5.2-3: REFER (P-CSCF to S-CSCF)

```
REFER sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:
```

- Request-URI:** The first component of the saved Route header.
- Route:** Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).
- Contact:** A locally defined value that identifies the UE.

4. Service Control

5. REFER (S-CSCF to S-CSCF) – see example in table 10.5.2-5

In order to maintain the expectation of privacy of the identity of the new destination, S-CSCF#2 converts the "Refer-To" header into a private URL. S-CSCF#2 forwards the Refer request to S-CSCF#1.

Table 10.5.2-5: REFER (S-CSCF to S-CSCF)

```
REFER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
    SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:431h23.1@pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To: sip:token(user3_public3@home3.net)@scscf2.home2.net;private
Referred-By:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Content-Length:
```

6. Service Control

7. REFER (S-CSCF to P-CSCF) – see example in table 10.5.2-7

S-CSCF#1 forwards the Refer request to P-CSCF#1.

Table 10.5.2-7: REFER (S-CSCF to P-CSCF)

```
REFER sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UEP scscf1.home1.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:
```

8. REFER (P-CSCF to UE) – see example in table 10.5.2-8

P-CSCF#1 forwards the Refer request to UE#1.

Table 10.5.2-8: REFER (P-CSCF to UE)

```
REFER sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:
```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

9. 202-Accepted (UE to P-CSCF) – see example in table 10.5.2-9

UE#2 acknowledges receipt of the Refer request (8) with a 202-Accepted final response, sent to P-CSCF#1.

Table 10.5.2-8: 202 Accepted (UE to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. 202-Accepted (P-CSCF to S-CSCF) – see example in table 10.5.2-10

P-CSCF#1 forwards the 202 Accepted final response to S-CSCF#1.

Table 10.5.2-10: 202 Accepted (P-CSCF to S-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UEP scscf1.home1.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF restores the Via headers from the branch value in its Via.

11. 202-Accepted (S-CSCF to S-CSCF) – see example in table 10.5.2-11

S-CSCF#1 forwards the 202 Accepted final response to S-CSCF#2.

Table 10.5.2-11: 202 Accepted (S-CSCF to S-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

12. 202-Accepted (S-CSCF to P-CSCF) – see example in table 10.5.2-12

S-CSCF#2 forwards the 202 Accepted final response to P-CSCF#2.

Table 10.5.2-12: 202 Accepted (S-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

13. 202-Accepted (P-CSCF to UE) – see example in table 10.5.2-13

P-CSCF#2 forwards the 202 Accepted final response to UE#2.

Table 10.5.2-13: 202 Accepted (P-CSCF to UE)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

14. INVITE (UE to P-CSCF) – see example in table 10.5.2-14

UE#1 initiates an INVITE request based on the Refer-To header URL in the REFER request. The INVITE is sent from the UE to P-CSCF#1.

Table 10.5.2-14: INVITE (UE to P-CSCF)

```
INVITE sip:token(user3_public3@home3.net)@scscf2.home.net;private SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=74))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=75))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Referred-By: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
```

15. 100 Trying (P-CSCF to UE) – see example in table 10.5.2-15

P-CSCF#1 responds to the INVITE request (14) with a 100 Trying provisional response.

Table 10.5.2-15: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

16. INVITE (P-CSCF to S-CSCF) – see example in table 10.5.2-16

P-CSCF#1 remembers (from the registration procedure) the request routing for this UE. This becomes the Request-URI in the request. The Request-URI of the original INVITE request (14) is copied to the Route header. P-CSCF adds itself to the Via header.

Table 10.5.2-16: INVITE (P-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(user3_public3@home3.net)@scscf2.home.net;private
Record-Route: sip:pcscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

17. 100 Trying (S-CSCF to P-CSCF) – see example in table 10.5.2-17

S-CSCF#1 responds to the INVITE request (16) with a 100 Trying provisional response.

Table 10.5.2-17: 100 Trying (S-CSCF to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

18. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this call attempt.

19. INVITE (S-CSCF to I-CSCF) – see example in table 10.5.2-19

S-CSCF#1 performs an analysis of the destination address, which is a private URL generated by S-CSCF#2. S-CSCF#1 determines the network operator to whom the destination subscriber belongs. Since (for this example) the forwarding network operator does not desire to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request directly to I-CSCF#2.

Table 10.5.2-19: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:token(user3_public3@home3.net)@scscf2.home2.net;private SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

20. INVITE (I-CSCF to S-CSCF) – see example in table 10.5.2-20

I-CSCF#2 performs an analysis of the destination address, which is a private URL generated by S-CSCF#2. I-CSCF#2 forwards the INVITE request directly to S-CSCF#2.

Table 10.5.2-20: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:token(user3_public3@home3.net)@scscf2.home2.net;private SIP/2.0
Via: SIP/2.0/UDP sip:icscf2_s.home2.net, SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

NOTE 1: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

21. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.5.2-21

I-CSCF#2 responds to the INVITE request (19) by sending a 100 Trying provisional response to S-CSCF#1.

Table 10.5.2-21: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

22. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session transfer attempt.

23. INVITE (S-CSCF to I-CSCF) – see example in table 10.5.2-23

S-CSCF#2 determines the destination address from the private URL contained in the INVITE request. Based on information in that URL, and information saved from step #4 above (implementation decision), S-CSCF#2 verifies the validity of the transfer request, and that it is within a short time delay from the REFER request.

S-CSCF#2 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since (for this example) the forwarding network operator does not desire to keep their internal configuration hidden, S-CSCF#2 forwards the INVITE request directly to I-CSCF#3.

Table 10.5.2-23: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:user3_public3@home3.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net, sip:pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes;party=transferor
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

Editor's Note: Use of "party=transferor" in a separate Remote-Party-ID header is FFS.

24. 100 Trying (I-CSCF to S-CSCF) – see example in table 10.5.2-24

I-CSCF#3 responds to the INVITE request (24) by sending a 100 Trying provisional response to S-CSCF#2.

Table 10.5.2-24: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

25. Location Query

I-CSCF (at the border of the terminating subscriber's network) queries the HSS for current location information. It will send "Cx-location-query" to the HSS to obtain the location information for the destination.

26. Location Response

HSS responds with the address of the current S-CSCF for the terminating subscriber.

27. INVITE (I-CSCF to S-CSCF) – see example in table 10.5.2-27

I-CSCF#3 forwards the INVITE request to the S-CSCF (S-CSCF#3) that will handle the session termination.

Table 10.5.2-27: INVITE (I-CSCF to S-CSCF)

```
INVITE sip:scscf3.home3.net SIP/2.0
Via: SIP/2.0/UDP icscf3_s.home3.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home3.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

NOTE 2: The I-CSCF does not add itself to the Record-Route header, as it has no need to remain in the signalling path once the session is established.

28. 100 Trying (S-CSCF to I-CSCF) – see example in table 10.5.2-28

S-CSCF#3 responds to the INVITE request (28) with a 100 Trying provisional response.

Table 10.5.2-28: 100 Trying (S-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf3_s.home3.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

29. Service Control

S-CSCF#3 performs whatever service control logic is appropriate for this session attempt.

30. INVITE (S-CSCF to P-CSCF) – see example in table 10.5.2-30

S-CSCF#3 remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE request to P-CSCF#3.

Table 10.5.2-30: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:user3_public3@home3.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP icscf3_s.home3.net, SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf3.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
```

31. 100 Trying (P-CSCF to S-CSCF) – see example in table 10.5.2-31

P-CSCF#3 responds to the INVITE request (29) by sending a 100 Trying provisional response to S-CSCF#3.

Table 10.5.2-31: 100 Trying (P-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP icscf3_s.home3.net, SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

32. INVITE (P-CSCF to UE) – see example in table 10.5.2-32

P-CSCF forwards the INVITE request to the UE.

Table 10.5.2-32: INVITE (P-CSCF to UE)

```

INVITE sip:user3_public3@home3.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf3.home3.net;branch=token1
Supported:
Remote-Party-ID:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=

```

33. 100 Trying (UE to P-CSCF) – see example in table 10.5.2-33

UE#3 may optionally send a 100 Trying provisional response to P-CSCF.

Table 10.5.2-33: 100 Trying (UE to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf3.home3.net;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

34. Completion of Session Initiation

UE#1 and UE#3 complete the session initiation, as shown in the MO, S-S, and MT procedures.

35. NOTIFY (UE to P-CSCF) – see example in table 10.5.2-35

When the session with UE#3 has been successfully established, UE#1 sends a Notify request to its proxy, P-CSCF#1.

Table 10.5.2-35: Notify (UE to P-CSCF)

```

NOTIFY sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 NOTIFY
Event: refer
Content-Type: application/sip
Content-Length: (...)
200 OK

```

- Request-URI:** Contains the value of the Contact header from the 200-OK response to the initial INVITE.
- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response.
- Cseq:** Next higher sequential value.

36. Notify (P-CSCF to S-CSCF) – see example in table 10.5.2-36

P-CSCF adds a Route header, with the saved value corresponding to the session.

P-CSCF#1 forwards the Notify request to S-CSCF#1.

Table 10.5.2-36: Notify (P-CSCF to S-CSCF)

```

NOTIFY sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:
200 OK

```

- Request-URI:** The first component of the saved Route header.
- Route:** Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

37. Notify (S-CSCF to S-CSCF) – see example in table 10.5.2-37

S-CSCF#1 forwards the Notify request to S-CSCF#2.

Table 10.5.2-37: Notify (S-CSCF to S-CSCF)

```

NOTIFY sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:
200 OK

```

38. Notify (S-CSCF to P-CSCF) – see example in table 10.5.2-38

S-CSCF#2 forwards the Notify request to P-CSCF#2.

Table 10.5.2-38: Notify (S-CSCF to P-CSCF)

```

NOTIFY sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

39. Notify (P-CSCF to UE) – see example in table 10.5.2-39

P-CSCF#2 forwards the Notify request to UE#2.

Table 10.5.2-39: Notify (P-CSCF to UE)

```

NOTIFY sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

40. 200-OK (UE to P-CSCF) – see example in table 10.5.2-40

UE#2 acknowledges receipt of the Notify request (39) with a 200-OK final response, sent to P-CSCF#2.

Table 10.5.2-40: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

41. 200-OK (P-CSCF to S-CSCF) – see example in table 10.5.2-41

P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.

Table 10.5.2-41: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:

```

Content-Length:

P-CSCF restores the Via headers from the branch value in its Via.

42. 200-OK (S-CSCF to S-CSCF) – see example in table 10.5.2-42

S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.

Table 10.5.2-42: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

43. 200-OK (S-CSCF to P-CSCF) – see example in table 10.5.2-43

S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.

Table 10.5.2-43: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

44. 200-OK (P-CSCF to UE) – see example in table 10.5.2-44

P-CSCF#1 forwards the 200 OK final response to UE#1.

Table 10.5.2-44: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

45. SIP BYE (UE to P-CSCF) – see example in table 10.5.2-45

Upon receiving the notification of successful refer operation (39), UE#2 terminates the session with UE#1.

Table 10.5.2-45: SIP BYE (UE to P-CSCF)

```
BYE sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
To: "Alien Blaster" <sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 BYE
Content-Length: 0
```

Request-URI: Contains the value of the Contact header from the initial INVITE.

Via: Contains the IP address or FQDN of the originating UE.

From:/To:/Call-ID: Contain the values previously used to establish the session, including the tag value from the response. Since this request is being initiated by the destination, the From and To are reversed.

Cseq: Next higher sequential value.

46. SIP BYE (P-CSCF to S-CSCF) – see example in table 10.5.2-46

P-CSCF adds a Route header, with the saved value corresponding to the session.

P-CSCF#2 forwards the BYE request to S-CSCF#2.

Table 10.5.2-46: SIP BYE (P-CSCF to S-CSCF)

```

BYE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net, sip: [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

47. SIP BYE (S-CSCF to S-CSCF) – see example in table 10.5.2-47

S-CSCF#2 forwards the SIP BYE request to S-CSCF#1.

Table 10.5.2-47: SIP BYE (S-CSCF to S-CSCF)

```

BYE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:pcscf1.home1.net, sip: [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

48. SIP BYE (S-CSCF to P-CSCF) – see example in table 10.5.2-48

S-CSCF#1 forwards the SIP BYE request to P-CSCF#1.

Table 10.5.2-48: SIP BYE (S-CSCF to P-CSCF)

```

BYE sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1,
SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip: [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

49. SIP BYE (P-CSCF to UE) – see example in table 10.5.2-49

P-CSCF#2 forwards the SIP BYE request to UE#2.

Table 10.5.2-49: SIP BYE (P-CSCF to UE)

```

BYE sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0

```

```
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1;branch=token1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

50. 200-OK (UE to P-CSCF) – see example in table 10.5.2-50

UE#2 acknowledges receipt of the SIP BYE request (49) with a 200-OK final response, sent to P-CSCF#1.

Table 10.5.2-50: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

51. 200-OK (P-CSCF to S-CSCF) – see example in table 10.5.2-51

P-CSCF#1 forwards the 200 OK final response to S-CSCF#1.

Table 10.5.2-51: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1,
SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF restores the Via headers from the branch value in its Via.

52. 200-OK (S-CSCF to S-CSCF) – see example in table 10.5.2-52

S-CSCF#1 forwards the 200 OK final response to S-CSCF#2.

Table 10.5.2-52: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

53. 200-OK (S-CSCF to P-CSCF) – see example in table 10.5.2-53

S-CSCF#2 forwards the 200 OK final response to P-CSCF#2.

Table 10.5.2-53: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
```

```
CSeq:  
Content-Length:
```

54. 200-OK (P-CSCF to UE) – see example in table 10.5.2-54

P-CSCF#2 forwards the 200 OK final response to UE#2.

Table 10.5.2-54: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK  
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]  
From:  
To:  
Call-ID:  
CSeq:  
Content-Length:
```

10.5.3 Session Transfer replacing an existing session

An IM session already exists between UE#1 and UE#2, and an IM session already exists between UE#2 and UE#3. UE#2 desires UE#1 to initiate a new session to destination UE#3, and terminate the existing sessions. The procedures for this transfer are shown in figure 10.5.3-1.

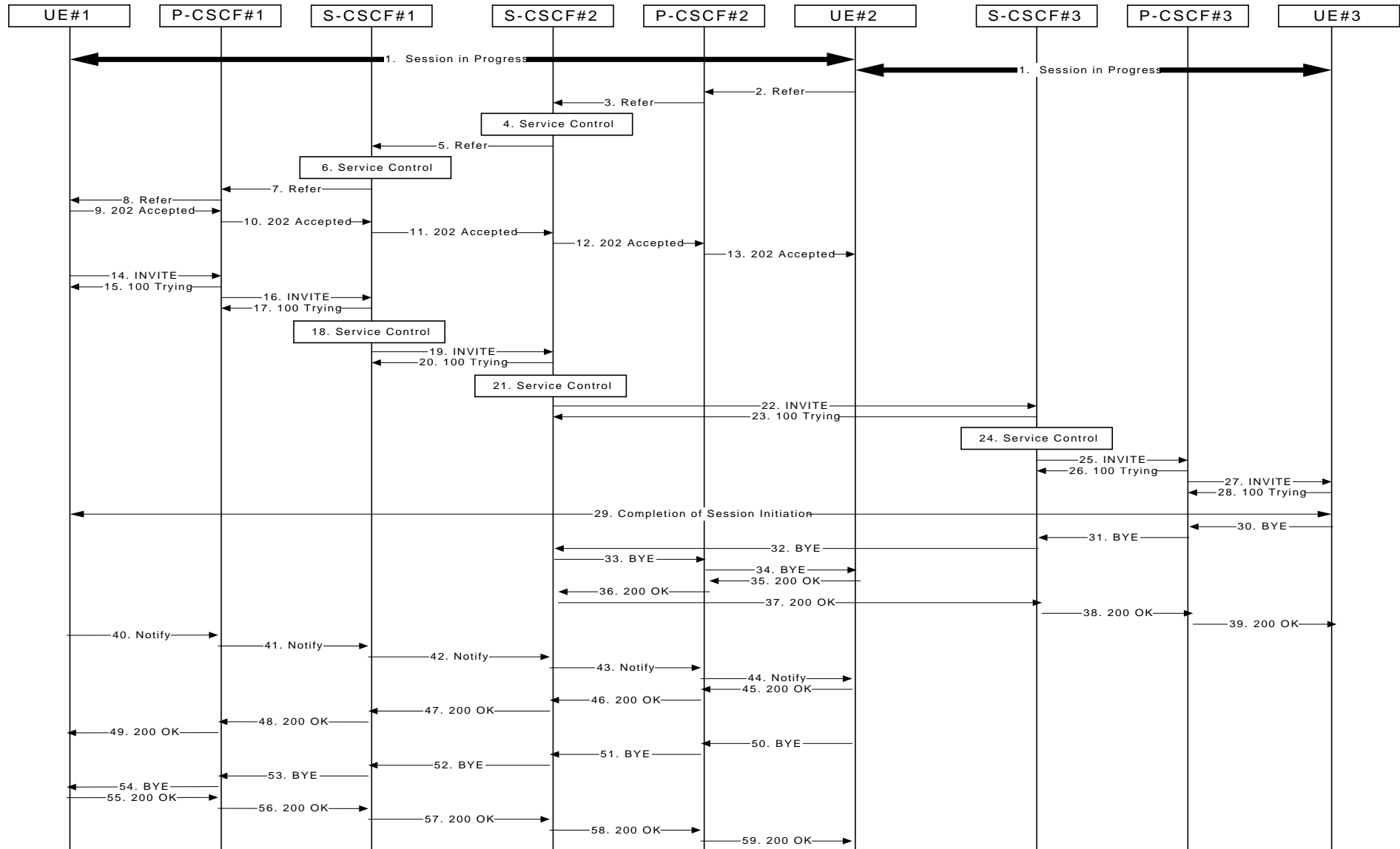


Figure 10.5.3-1: Session Transfer replacing an existing session

1. Sessions in Progress

UE#1 initiates a multimedia session with UE#2. As a result, the state information stored at P-CSCF#2 is shown in table 10.5.3-1a.

Table 10.5.3-1a: State Information

```
Request-URI: sip:[5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
```

UE#2 initiates a multimedia session with UE#3. As a result, the state information stored at P-CSCF#2 is shown in table 10.5.3-1b.

Table 10.5.3-1b: State Information

```
Request-URI: sip:[5555::aaa:bbb:ccc:fff]
From: sip:B36(SHA-1(+1-212-555-2222; time=36123F05; seq=31))@localhost;tag=171828
To: sip:B36(SHA-1(+1-212-555-3333; time=36123F05; seq=32))@localhost;tag=314159
Call-ID: B36(SHA-1(555-1111;time=36123E5B;seq=31))@localhost
Route: sip:764z87.1@scscf2.home2.net, sip:scscf3.home3.net, sip:pcscf3.home.net
```

UE#2 has placed both of these sessions on hold.

2. REFER (UE to P-CSCF) – see example in table 10.5.3-2

UE#2 sends a Refer request to its proxy, P-CSCF#2.

Table 10.5.3-2: REFER (UE to P-CSCF)

```
REFER sip:sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
To: "Alien Blaster" <sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 REFER
Contact: sip:[5555::eee:fff:aaa:bbb]
Refer-To: sip:user3_public3@home3.net
Replaces: B36(SHA-1(555-1111;time=36123E5B;seq=31))@localhost;to-tag=314149;from-tag=171828
Referred-By: sip:B36(SHA-1(+1-212-555-2222; time=36123F05; seq=31))@localhost;tag=171828
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Content-Length: 0
```

- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response.
- Cseq:** Next higher sequential value.
- Contact:** The IP address or FQDN of the originating UE.

Editor's Note: Use of Remote-Party-ID in REFER is FFS.

Editor's Note: The proper value for the Referred-By header is FFS. The value of the From header of the session to be replaced seems most appropriate.

3. REFER (P-CSCF to S-CSCF) – see example in table 10.5.3-3

P-CSCF adds a Route header, with the saved value corresponding to the session. P-CSCF#2 forwards the Refer request to S-CSCF#2.

Table 10.5.3-3: REFER (P-CSCF to S-CSCF)

```

REFER sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

4. Service Control

5. REFER (S-CSCF to S-CSCF) – see example in table 10.5.3-5

In order to maintain the expectation of privacy of the identity of the new destination, S-CSCF#2 converts the "Refer-To" header into a private URL. S-CSCF#2 forwards the Refer request to S-CSCF#1.

NOTE: If the network operator desired configuration independence, the REFER would be routed through an I-CSCF before leaving the operator's network. For example, see configuration S-S#1b. That I-CSCF would convert the private URL into one that specified the I-CSCF as the hostname.

Table 10.5.3-5: REFER (S-CSCF to S-CSCF)

```

REFER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To: sip:token(user3_public3@home3.net)@scscf2.home2.net;private
Replaces: B36(SHA-1(555-1111;time=36123E5B;seq=31))@localhost;to-tag=314149;from-tag=171828
Referred-By:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Content-Length:

```

6. Service Control

7. REFER (S-CSCF to P-CSCF) – see example in table 10.5.3-7

S-CSCF#1 forwards the Refer request to P-CSCF#1.

Table 10.5.3-7: REFER (S-CSCF to P-CSCF)

```

INVITE sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UEP scscf1.home1.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:

```

8. REFER (P-CSCF to UE) – see example in table 10.5.3-8

P-CSCF#1 forwards the Refer request to UE#1.

Table 10.5.3-8: REFER (P-CSCF to UE)

```
REFER sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
Cseq:
Contact:
Refer-To:
Referred-By:
Remote-Party-ID:
Content-Length:
```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

9. 202-Accepted (UE to P-CSCF) – see example in table 10.5.3-9

UE#2 acknowledges receipt of the Refer request (8) with a 202-Accepted final response, sent to P-CSCF#1.

Table 10.5.3-8: 202 Accepted (UE to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. 202-Accepted (P-CSCF to S-CSCF) – see example in table 10.5.3-10

P-CSCF#1 forwards the 202 Accepted final response to S-CSCF#1.

Table 10.5.3-10: 202 Accepted (P-CSCF to S-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UEP scscf1.home1.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF restores the Via headers headers from the branch value in its Via.

11. 202-Accepted (S-CSCF to S-CSCF) – see example in table 10.5.3-11

S-CSCF#1 forwards the 202 Accepted final response to S-CSCF#2.

Table 10.5.3-11: 202 Accepted (S-CSCF to S-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

12. 202-Accepted (S-CSCF to P-CSCF) – see example in table 10.5.3-12

S-CSCF#2 forwards the 202 Accepted final response to P-CSCF#2.

Table 10.5.3-12: 202 Accepted (S-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

13. 202-Accepted (P-CSCF to UE) – see example in table 10.5.3-13

P-CSCF#2 forwards the 202 Accepted final response to UE#2.

Table 10.5.3-13: 202 Accepted (P-CSCF to UE)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF removes the Record-Route header

14. INVITE (UE to P-CSCF) – see example in table 10.5.3-14

UE#1 initiates an INVITE request based on the Refer-To header URL in the REFER request. The INVITE is sent from the UE to P-CSCF#1.

Table 10.5.3-14: INVITE (UE to P-CSCF)

```
INVITE sip:token(user3_public3@home3.net)@scscf2.home2.net;private SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Proxy-Require: privacy
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=74))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=75))@localhost
Call-ID: B36(SHA-1(555-1111;time=36123E5B;seq=31))@localhost
Cseq: 127 INVITE
Contact: [5555::aaa:bbb:ccc:ddd]
Referred-By: sip:B36(SHA-1(+1-212-555-2222; time=36123F05; seq=31))@localhost;tag=171828
Replaces: B36(SHA-1(555-1111;time=36123E5B;seq=31))@localhost;to-tag=314149;from-tag=171828
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=gos:mandatory sendrecv
```

15. 100 Trying (P-CSCF to UE) – see example in table 10.5.3-15

P-CSCF#1 responds to the INVITE request (14) with a 100 Trying provisional response.

Table 10.5.3-15: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

16. INVITE (P-CSCF to S-CSCF) – see example in table 10.5.3-16

P-CSCF#1 remembers (from the registration procedure) the request routing for this UE. This becomes the Request-URI in the request. The Request-URI of the original INVITE request (14) is copied to the Route header. P-CSCF adds itself to the Via header.

Table 10.5.3-16: INVITE (P-CSCF to S-CSCF)

```
INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(user3_public3@home3.net)@scscf2.home2.net;private
Record-Route: pcscf1.home1.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Replaces:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
```

17. 100 Trying (S-CSCF to P-CSCF) – see example in table 10.5.3-17

S-CSCF#1 responds to the INVITE request (16) with a 100 Trying provisional response.

Table 10.5.3-17: 100 Trying (S-CSCF to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

18. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

19. INVITE (S-CSCF to S-CSCF) – see example in table 10.5.3-19

S-CSCF#1 performs an analysis of the destination address, which is a private URL generated by S-CSCF#2. Since it is a destination within the same operator's network, S-CSCF#1 forwards the INVITE request directly to S-CSCF#2.

Table 10.5.3-19: INVITE (S-CSCF to S-CSCF)

```

INVITE sip:token(user3_public3@home3.net)@scscf2.home2.net;private SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Replaces:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

20. 100 Trying (S-CSCF to S-CSCF) – see example in table 10.5.3-20

S-CSCF#2 responds to the INVITE request (19) by sending a 100 Trying provisional response to S-CSCF#1.

Table 10.5.3-20: 100 Trying (S-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

21. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session transfer attempt.

22. INVITE (S-CSCF to S-CSCF) – see example in table 10.5.3-22

S-CSCF#2 determines the destination address from the private URL contained in the INVITE request. Based on information in that URL, and information saved from step #4 above (implementation decision), S-CSCF#2 verifies the validity of the transfer request, and that it is within a short time delay from the REFER request.

S-CSCF#2 builds a Route header based on stored state information for the Refer'd session (as determined by the Call-ID and Referred-By values in step #4 above).

S-CSCF#2 forwards the INVITE request to S-CSCF#3.

Table 10.5.3-22: INVITE (S-CSCF to S-CSCF)

```

INVITE sip:scscf3.home3.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Route: sip:pcscf3.home.net, sip:user3_public3@home3.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes;party=transferor
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Replaces:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Editor's Note: Use of "party=transferor" in a separate Remote-Party-ID header is FFS.

23. 100 Trying (S-CSCF to S-CSCF) – see example in table 10.5.3-23

S-CSCF#3 responds to the INVITE request (22) by sending a 100 Trying provisional response to S-CSCF#2.

Table 10.5.3-23: 100 Trying (S-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

24. Service Control

S-CSCF#3 performs whatever service control logic is appropriate for this session attempt.

25. INVITE (S-CSCF to P-CSCF) – see example in table 10.5.3-25

S-CSCF#3 uses the Route header value to determine the next hop CSCF for this UE. It forwards the INVITE request to P-CSCF#3.

Table 10.5.3-25: INVITE (S-CSCF to P-CSCF)

```

INVITE sip:pcscf3.home3.net SIP/2.0
Via: SIP/2.0/UDP scscf3.home3.net, , SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:scscf3.home.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Route: sip:user3_public3@home3.net
Supported:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Replaces:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

26. 100 Trying (P-CSCF to S-CSCF) – see example in table 10.5.3-26

P-CSCF#3 responds to the INVITE request (25) by sending a 100 Trying provisional response to S-CSCF#3.

Table 10.5.3-26: 100 Trying (P-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

27. INVITE (P-CSCF to UE) – see example in table 10.5.3-27

P-CSCF forwards the INVITE request to the UE.

Table 10.5.3-27: INVITE (P-CSCF to UE)

```

INVITE sip:user3_public3@home3.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf3.home3.net;branch=token1
Supported:
Remote-Party-ID:
Remote-Party-ID:
Proxy-Require:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Referred-By:
Replaces:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

28. 100 Trying (UE to P-CSCF) – see example in table 10.5.3-28

UE#3 may optionally send a 100 Trying provisional response to P-CSCF.

Table 10.5.3-28: 100 Trying (UE to P-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf3.home3.net;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

29. Completion of Session Initiation

UE#1 and UE#3 complete the session initiation, as shown in the MO, S-S, and MT procedures.

30. SIP BYE (UE to P-CSCF) – see example in table 10.5.3-30

Upon receiving the session invitation containing Replaces header, UE#3 terminates the session with UE#2.

Table 10.5.3-30: SIP BYE (UE to P-CSCF)

```

BYEsip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 BYE
Content-Length: 0

```

Request-URI: Contains the value of the Contact header from the initial INVITE.

Via: Contains the IP address or FQDN of the originating UE.

From:/To:/Call-ID: Contain the values previously used to establish the session, including the tag value from the response.

Cseq: Next higher sequential value.

31. SIP BYE (P-CSCF to S-CSCF) – see example in table 10.5.3-31

P-CSCF adds a Route header, with the saved value corresponding to the session.

P-CSCF#3 forwards the BYE request to S-CSCF#3.

Table 10.5.3-31: SIP BYE (P-CSCF to S-CSCF)

```
BYE sip:scscf3.home3.net SIP/2.0
Via: SIP/2.0/UDP pcscf3.home3.net, SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

32. SIP BYE (S-CSCF to S-CSCF) – see example in table 10.5.3-32

S-CSCF#3 forwards the SIP BYE request to S-CSCF#2.

Table 10.5.3-32: SIP BYE (S-CSCF to S-CSCF)

```
BYE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:fff]
Route: sip:876t12.1@pcscf2.home2.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

33. SIP BYE (S-CSCF to P-CSCF) – see example in table 10.5.3-33

S-CSCF#2 forwards the SIP BYE request to P-CSCF#2.

Table 10.5.3-33: SIP BYE (S-CSCF to P-CSCF)

```
BYE sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP
pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

34. SIP BYE (P-CSCF to UE) – see example in table 10.5.3-34

P-CSCF#2 forwards the SIP BYE request to UE#2.

Table 10.5.3-34: SIP BYE (P-CSCF to UE)

```

BYE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

35. 200-OK (UE to P-CSCF) – see example in table 10.5.3-35

UE#2 acknowledges receipt of the SIP BYE request (34) with a 200-OK final response, sent to P-CSCF#2.

Table 10.5.3-35: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

36. 200-OK (P-CSCF to S-CSCF) – see example in table 10.5.3-36

P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.

Table 10.5.3-36: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP
pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

P-CSCF restores the Via headers from the branch value in its Via.

37. 200-OK (S-CSCF to S-CSCF) – see example in table 10.5.3-37

S-CSCF#2 forwards the 200 OK final response to S-CSCF#3.

Table 10.5.3-37: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf3.home3.net, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:fff]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

38. 200-OK (S-CSCF to P-CSCF) – see example in table 10.5.3-38

S-CSCF#3 forwards the 200 OK final response to P-CSCF#3.

Table 10.5.3-38: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

39. 200-OK (P-CSCF to UE) – see example in table 10.5.3-39

P-CSCF#3 forwards the 200 OK final response to UE#3.

Table 10.5.3-39: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:fff]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

40. NOTIFY (UE to P-CSCF) – see example in table 10.5.3-40

When the session with UE#3 has been successfully established, UE#1 sends a Notify request to its proxy, P-CSCF#1. The session leg identification for this Notify is taken from that used in the Refer, earlier.

Table 10.5.3-40: Notify (UE to P-CSCF)

```
NOTIFY sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 NOTIFY
Event: refer
Content-Type: application/sip
Content-Length: (...)

200 OK
```

- Request-URI:** Contains the value of the Contact header from the 200-OK response to the initial INVITE.
- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response.
- Cseq:** Next higher sequential value.

41. Notify (P-CSCF to S-CSCF) – see example in table 10.5.3-41

P-CSCF adds a Route header, with the saved value corresponding to the session. P-CSCF#1 forwards the Notify request to S-CSCF#1.

Table 10.5.3-41: Notify (P-CSCF to S-CSCF)

```

NOTIFY sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

42. Notify (S-CSCF to S-CSCF) – see example in table 10.5.3-42

S-CSCF#1 forwards the Notify request to S-CSCF#2.

Table 10.5.3-42: Notify (S-CSCF to S-CSCF)

```

NOTIFY sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

43. Notify (S-CSCF to P-CSCF) – see example in table 10.5.3-43

S-CSCF#2 forwards the Notify request to P-CSCF#2.

Table 10.5.3-43: Notify (S-CSCF to P-CSCF)

```

NOTIFY sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

44. Notify (P-CSCF to UE) – see example in table 10.5.3-44

P-CSCF#2 forwards the Notify request to UE#2.

Table 10.5.3-44: Notify (P-CSCF to UE)

```

NOTIFY sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
Cseq:
Event:
Content-Type:
Content-Length:

200 OK

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

45. 200-OK (UE to P-CSCF) – see example in table 10.5.3-45

UE#2 acknowledges receipt of the Notify request (34) with a 200-OK final response, sent to P-CSCF#2.

Table 10.5.3-45: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

46. 200-OK (P-CSCF to S-CSCF) – see example in table 10.5.3-46

P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.

Table 10.5.3-46: 200 OK (P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

P-CSCF restores the Via headers from the branch value in its Via.

47. 200-OK (S-CSCF to S-CSCF) – see example in table 10.5.3-47

S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.

Table 10.5.3-47: 200 OK (S-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

48. 200-OK (S-CSCF to P-CSCF) – see example in table 10.5.3-48

S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.

Table 10.5.3-48: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

49. 200-OK (P-CSCF to UE) – see example in table 10.5.3-49

P-CSCF#1 forwards the 200 OK final response to UE#1.

Table 10.5.3-49: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

50. SIP BYE (UE to P-CSCF) – see example in table 10.5.3-50

Upon receiving the notification of successful refer operation (34), UE#2 terminates the session with UE#1.

Table 10.5.3-40: SIP BYE (UE to P-CSCF)

```
BYE sip:[5555::aaa:bbb:ccc:ddd]SIP/2.0
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost;tag=314159
To: "Alien Blaster" <sip:B36(SHA-1(+1-212-555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 BYE
Content-Length: 0
```

- Request-URI:** Contains the value of the Contact header from the initial INVITE.
- Via:** Contains the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Contain the values previously used to establish the session, including the tag value from the response. Since this request is being initiated by the destination, the From and To are reversed.
- Cseq:** Next higher sequential value.

51. SIP BYE (P-CSCF to S-CSCF) – see example in table 10.5.3-51

P-CSCF adds a Route header, with the saved value corresponding to the session. P-CSCF#2 forwards the Notify request to S-CSCF#2.

Table 10.5.3-51: SIP BYE (P-CSCF to S-CSCF)

```
BYE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:332b23.1@scscf1.home1.net, sip:pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

- Request-URI:** The first component of the saved Route header.

Route: Saved from the 200-OK response to the initial INVITE (with first element moved to Request-URI).

52. SIP BYE (S-CSCF to S-CSCF) – see example in table 10.5.3-52

S-CSCF#2 forwards the SIP BYE request to S-CSCF#1.

Table 10.5.3-52: SIP BYE (S-CSCF to S-CSCF)

```

BYE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
    SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:pcscf1.home1.net, sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

53. SIP BYE (S-CSCF to P-CSCF) – see example in table 10.5.3-53

S-CSCF#1 forwards the SIP BYE request to P-CSCF#1.

Table 10.5.3-53: SIP BYE (S-CSCF to P-CSCF)

```

BYE sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1,
    SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
Route: sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

54. SIP BYE (P-CSCF to UE) – see example in table 10.5.3-54

P-CSCF#2 forwards the SIP BYE request to UE#2.

Table 10.5.3-54: SIP BYE (P-CSCF to UE)

```

BYE sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1;branch=token1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

55. 200-OK (UE to P-CSCF) – see example in table 10.5.3-55

UE#2 acknowledges receipt of the SIP BYE request (44) with a 200-OK final response, sent to P-CSCF#1.

Table 10.5.3-55: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1;branch=token1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

56. 200-OK (P-CSCF to S-CSCF) – see example in table 10.5.3-56

P-CSCF#1 forwards the 200 OK final response to S-CSCF#1.

Table 10.5.3-56: 200 OK (P-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1,
    SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF restores the Via headers from the branch value in its Via.

57. 200-OK (S-CSCF to S-CSCF) – see example in table 10.5.3-57

S-CSCF#1 forwards the 200 OK final response to S-CSCF#2.

Table 10.5.3-57: 200 OK (S-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1,
    SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

58. 200-OK (S-CSCF to P-CSCF) – see example in table 10.5.3-58

S-CSCF#2 forwards the 200 OK final response to P-CSCF#2.

Table 10.5.3-58: 200 OK (S-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.home2.net;branch=876t12.1, SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

59. 200-OK (P-CSCF to UE) – see example in table 10.5.3-59

P-CSCF#2 forwards the 200 OK final response to UE#2.

Table 10.5.3-59: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

11 Void

This clause is intentionally left void.

12 Void

This clause is intentionally left void.

13 Void

This clause is intentionally left void.

14 Void

This clause is intentionally left void.

15 Void

This clause is intentionally left void.

16 Signalling flows for REGISTER (hiding)

16.1 Introduction

See subclause 6.1.

16.2 Registration signalling: user not registered

Figure 16.2-1 shows the registration signalling flow for the scenario when the user is not registered. For the purpose of this signalling flow, the subscriber is considered to be roaming. This flow also shows the authentication of the private user identity. In this signalling flow, the home network has network configuration hiding active.

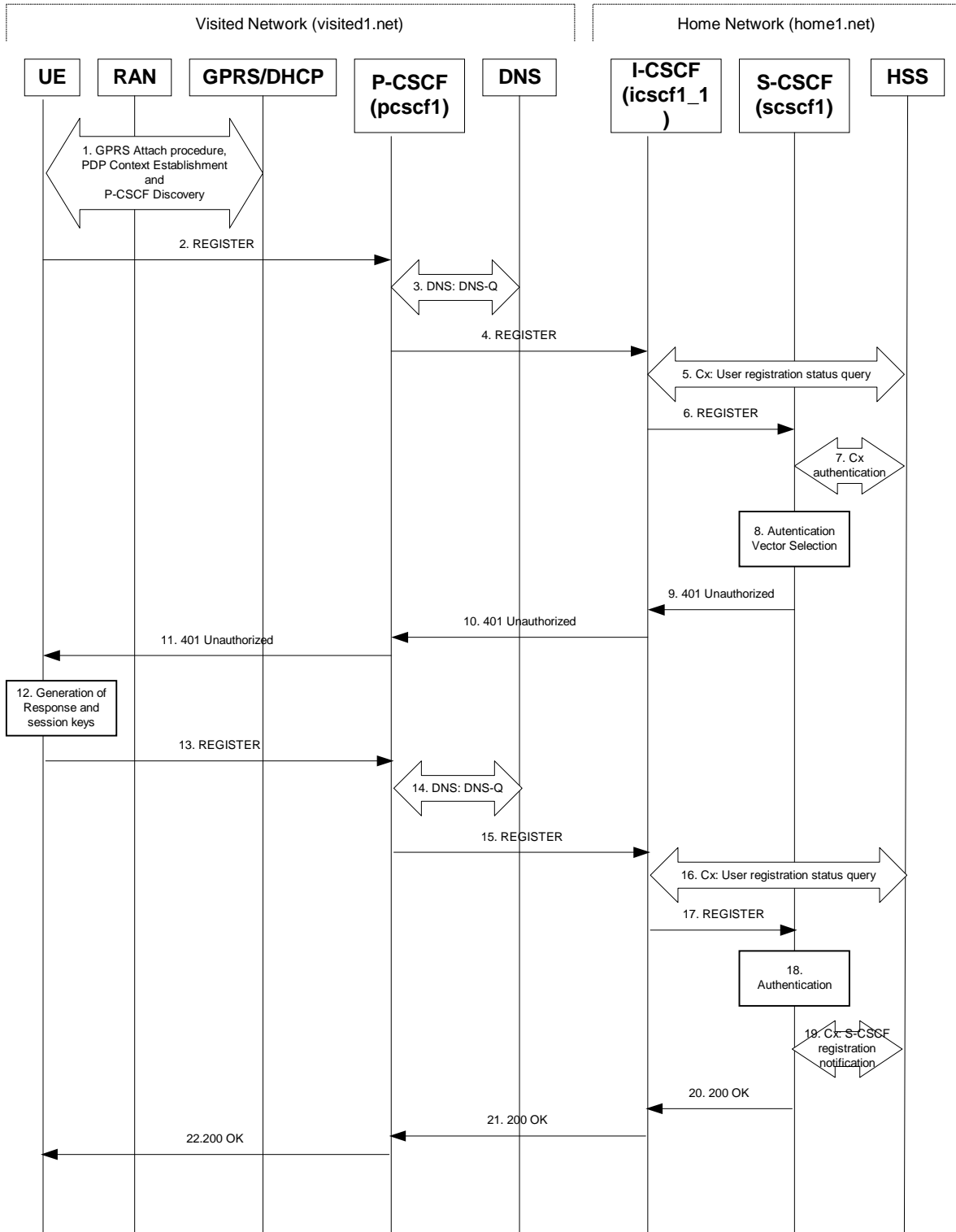


Figure 16.2-1: Registration when UE roaming

1. GPRS Attach / PDP Context Establishment and P-CSCF Discovery (UE to GPRS)

This signalling flow is shown to indicate prerequisites for the registration signalling.

See subclause 5.2 for details.

2. REGISTER request (UE to P-CSCF) – see example in table 16.2-2

The purpose of this request is to register the user's SIP URI with a S-CSCF in the home network. This request is routed to the P-CSCF because it is the only SIP server known to the UE. In the following SIP request, the Contact field contains the user's host address.

The P-CSCF will perform two actions, binding and forwarding. The binding is between the User's SIP address (user1_public1@home1.net) and the host (terminal) address ([5555::aaa:bbb:ccc:ddd]) which was acquired during PDP context activation process.

Editor's note: The security mode set-up procedure supports the negotiation of different protection mechanisms. This will involve the addition of a "security-setup" field to the SIP REGISTER request and the REGISTER response performing the authentication challenge containing the parameters:

list of Authentication (integrity) algorithms, and optionally list of encryption (confidentiality) algorithms

SA-ID that is used to uniquely identify the SA at the receiving side.

Key length: the length of encryption and authentication (integrity) keys is 128 bits.

The exact format and use for the security mode setup is being worked through IETF and is FFS

Table 16.2-2 REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfgkjkj49111
Authorization: eap eap-p=base64(user1_private1@home1.net)
CSeq: 1 REGISTER
Expires: 7200
Content-Length: 0
```

Request-URI: The Request-URI (the URI that follows the method name, "REGISTER", in the first line) indicates the destination domain of this REGISTER request. The rules for routing a SIP request describe how to use DNS to resolve this domain name ("home1.net") into an address or entry point into the home operator's network (the I-CSCF). This information is stored in the USIM.

Via: IPv6 PDP address of the SIP session allocated during the PDP Context Activation process.

From: This indicates the public user identity originating the REGISTER request. The public user identity may be obtained from the USIM.

To: This indicates the public user identity being registered. This is the identity by which other parties know this subscriber. It may be obtained from the USIM.

Contact: This indicates the point-of-presence for the subscriber – the IP address of the UE. This is the temporary point of contact for the subscriber that is being registered. Subsequent requests destined for this subscriber will be sent to this address. This information is stored in the P-CSCF and S-CSCF.

Editor's note: It is for further study whether this information is stored in the HSS and the S-CSCF for the subscriber in order to support multiple registrations.

Authorization: It carries authentication information. The private user identity (user1_private1@home1.net) is carried in the user ID field of the extensible authentication protocol (EAP).

Upon receiving this request the P-CSCF will set it's SIP registration timer for this UE to the Expires time in this request.

3. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 16.2-3a DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=_sip_udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC 2782 [4].

Table 16.2-3b DNS: DNS Query Response (DNS to P-CSCF)

```
OPCODE=SQUERY, RESPONSE, AA
QNAME=_sip_udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip_udp.registrar.home1.net      0 IN SRV 1 10 5060 icscf1_p.home1.com
                                   0 IN SRV 1  0 5060 icscf7_p.home1.com

icscf1_p.home1.net                0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                0 IN AAAA      5555::ala:b2b:c3c:d4d
```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

4. REGISTER request (P-CSCF to I-CSCF) – see example in table 16.2-4

The P-CSCF needs to be in the path for all mobile originated and mobile terminated requests for this user. To ensure this, the P-CSCF adds itself to the path for future requests.

The P-CSCF binds the public user identity under registration to the Contact header supplied by the user.

The P-CSCF adds also the Roaming-Info header (if not present). The P-CSCF adds the *vnid* parameter with the contents of the identifier of the P-CSCF network. This may be the visited network domain name or any other identifier that identifies the visited network at the home network.

This signalling flow shows the REGISTER request being forward from the P-CSCF to the I-CSCF in the home domain.

Table 16.2-4 REGISTER request (P-CSCF to I-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Require:/Proxy-Require: These headers are included to ensure that the recipient correctly handles the Path header. If the recipient does not support the path header, a response will be received with a status code of 420 and an Unsupported header indicating "path". Such a response indicates a misconfiguration of the routing tables and the request has been routed outside the IM CN subsystem.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

5. Cx: User registration status query procedure

The I-CSCF makes a request for information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. The HSS returns the S-CSCF required capabilities and the I-CSCF uses this information to select a suitable S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-5a provides the parameters in the REGISTER request (flow 4) which need to be sent to HSS.

6. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.2-6

I-CSCF adds a proper I-CSCF name to the Path header.

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected. The Request-URI is changed to the address of the S-CSCF.

Table 16.2-6 REGISTER request (I-CSCF to S-CSCF)

```

REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

Upon receiving this request the S-CSCF will set its SIP registration timer for this UE to the Expires time in this request.

7. Cx: S-CSCF authentication procedure

On receiving a REGISTER request from an unauthenticated user, the S-CSCF requires at least one authentication vector to be used in the challenge to the user. If a valid AV is not available, then the S-CSCF requests at least one AV from the HSS.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-7a provides the parameters in the REGISTER request (flow 6) which need to be sent to HSS.

8. Authentication vector selection

The S-CSCF selects an authentication vector for use in the authentication challenge. For detailed description of the authentication vector, see 3GPP TS 33.203.

NOTE 1: The authentication vector may be of the form 3GPP TS 33.203 (if IMS AKA is the selected authentication scheme):

AV = RAND_n||AUTN_n||XRES_n||CK_n||IK_n where:

- RAND: random number used to generate the XRES, CK, IK, and part of the AUTN. It is also used to generate the RES at the UE.
- AUTN: Authentication token (including MAC and SQN).
- XRES: Expected (correct) result from the UE.
- CK: Cipher key (optional).
- IK: Integrity key.

9. 401 Unauthorized response (S-CSCF to I-CSCF) – see example in table 16.2-9

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 16.2-9: 401 Unauthorized response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_private1@home1.net, RAND, AUTN)
CSeq:
Content-Length:
```

NOTE 2: The actual WWW-Authenticate header value may look like this as it is in base64 form:

- WWW-Authenticate: eap eap-p=QWxh4ZGRpb2jpvGVuNlctZQ==

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

10. 401 Unauthorized response (I-CSCF to P-CSCF) – see example in table 16.2-10

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 16.2-10: 401 Unauthorized response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

11. 401 Unauthorized response (P-CSCF to UE) – see example in table 16.2-11

The P-CSCF removes any keys received in the 401 Unauthorized response and forwards the rest of the response to the UE.

Table 16.2-11: 401 Unauthorized response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

12. Generation of response and session keys at UE

Upon receiving the Unauthorized response, the UE extracts the MAC and the SQN from the AUTN. The UE calculates the XMAC and checks that XMAC matches the received MAC and that the SQN is in the correct range. If both these checks are successful the UE calculates the response, RES, and also computes the session keys IK and CK. The RES is put into the Authorization header and sent back to the registrar in the REGISTER request.

13. REGISTER request (UE to P-CSCF) – see example in table 16.2-13

Table 16.2-13 REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfg1kj49112
Authorization: eap eap-p=base64(user1_private1@home1.net, RES)
CSeq: 2 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 11 along with the private user identity both encoded in base64 format.

14. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 16.2-14a DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=_sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC 2782 [4].

Table 16.2-14b DNS Query Response (DNS to P-CSCF)

```

OPCODE=SQUERY, RESPONSE, AA
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
_sip._udp.registrar.home1.net          0 IN SRV 1 10 5060 icscf1_p.home1.net
                                       0 IN SRV 1  0 5060 icscf7_p.home1.net
icscf1_p.home1.net                    0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                    0 IN AAAA      5555::ala:b2b:c3c:d4d

```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

15. REGISTER request (P-CSCF to I-CSCF) – see example in table 16.2-15

This signalling flow shows the REGISTER request being forwarded from the P-CSCF to the I-CSCF in the home domain.

Table 16.2-15 REGISTER request (P-CSCF to I-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

16. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. The HSS returns the S-CSCF required capabilities and the I-CSCF uses this information to select a suitable S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-16a provides the parameters in the REGISTER request (flow 15) which need to be sent to HSS.

17. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.2-17

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 16.2-17 REGISTER request (I-CSCF to S-CSCF)

```

REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:

```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

18. Authentication

Upon receiving the REGISTER request, carrying the authentication response, RES, the S-CSCF checks that the user's active XRES matches the received RES. If the check is successful then the user has been authenticated and the public user identity is registered in the S-CSCF.

19. Cx: S-CSCF registration notification procedure

On registering a user the S-CSCF informs the HSS that the user has been registered at this instance. The HSS stores the S-CSCF name for that subscriber. For a positive response, the HSS will include the user profile in the response sent to the S-CSCF.

For detailed message flows see 3GPP TS 29.228.

Table 6.2-19a provides the parameters in the SIP REGISTER request (flow 17) which need to be sent to HSS.

20. 200 OK response (S-CSCF to I-CSCF) – see example in table 16.2-20

The S-CSCF sends acknowledgement to the I-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 16.2-20 200 OK response (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact: sip:[5555::aaa:bbb:ccc:ddd]
CSeq:
Date: Wed, 11 July 2001 08:49:37 GMT
Expires: 7200
Content-Length:

```

Path: The S-CSCF inserts its own name to the front of the list.

21. 200 OK response (I-CSCF to P-CSCF) – see example in table 16.2-21

The I-CSCF translates the S-CSCF name in the Path header. The I-CSCF forwards acknowledgement from the S-CSCF to the P-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 16.2-21 200 OK response (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:token(scscf1.home1.net)>, <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

22. 200 OK response (P-CSCF to UE) – see example in table 16.2-22

The P-CSCF removes its address from the Path header, reverses the order of the fields, saves the resulting Path header and associates it with the UE. The P-CSCF then removes the Path header from the 200 OK response. The P-CSCF then forwards acknowledgement from the I-CSCF to the UE indicating that Registration was successful.

Table 16.2-22 200 OK response (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

16.3 Registration signalling: reregistration – user currently registered

For the purpose of the reregistration signalling flow shown in figure 16.3-1, the subscriber is considered to be roaming. This flow also shows the authentication of the private user identity. In this signalling flow, the home network has network configuration hiding active.

This signalling flow assumes:

1. That the same PDP Context allocated during the initial registration scenario is still used for reregistration. For the case when the UE does not still have an active PDP context then PDP context procedures from subclause 16.2 is completed first.

Editor's Note: If the same PDP-Context is not available, is it guaranteed that the UE will get back the same IP address at this point? If this is not possible, would there be a problem with the binding in the P-CSCF (user_public1@home1.net and [5555::aaa:bbb:ccc:ddd])?2. The DHCP procedure employed for P-CSCF discovery is not needed.

2. The S-CSCF selection procedure invoked by the I-CSCF is not needed.

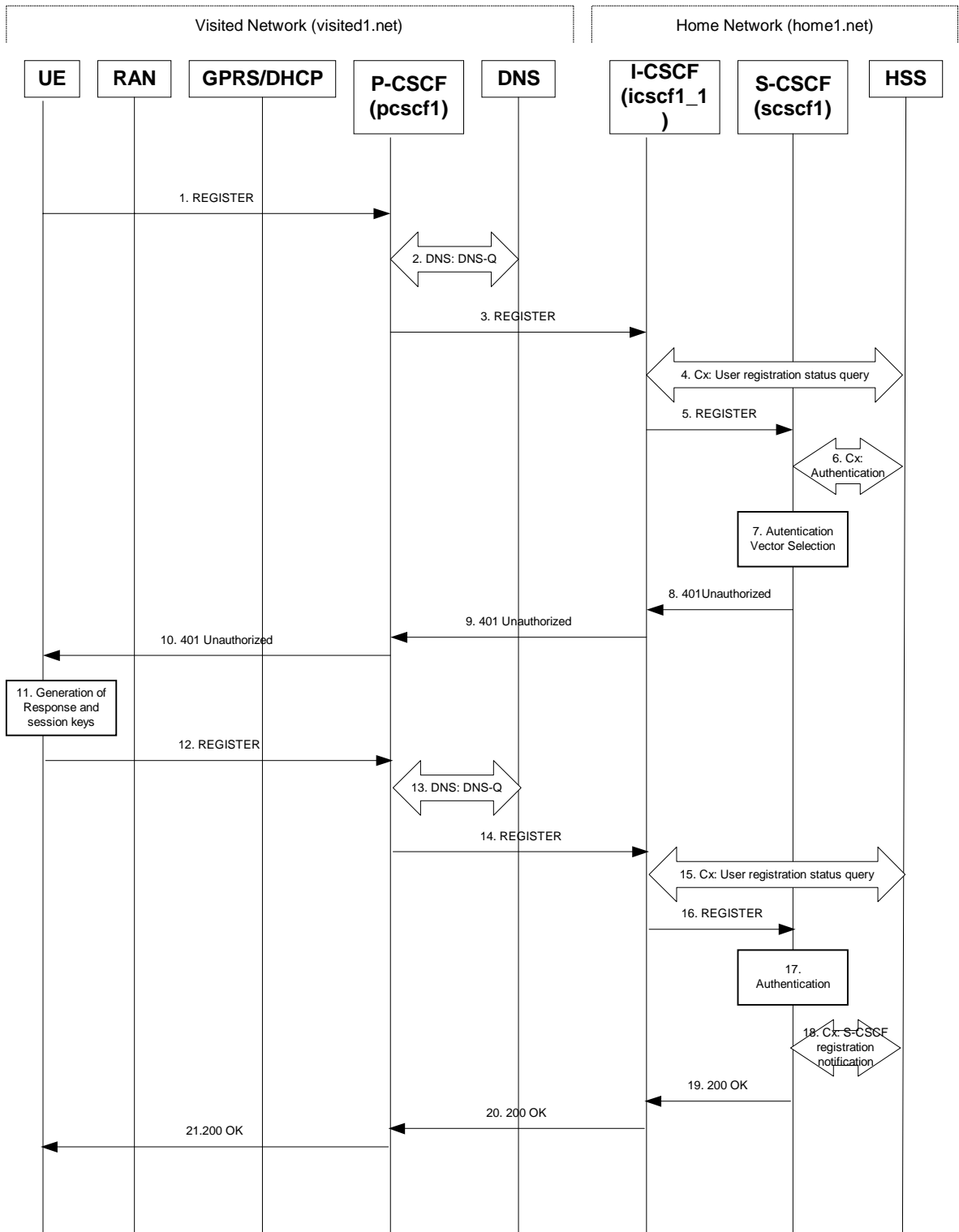


Figure 16.3-1: Reregistration when UE roaming

1. REGISTER request (UE to P-CSCF) – see example in table 16.3-1

The registration expires in the UE. The UE reregisters by sending a new REGISTER request. This request is sent to the same P-CSCF with which the UE initially registered. The P-CSCF maintains the same binding between the User's SIP public address (user1_public1@home1.net) and the host (terminal) address ([5555::aaa:bbb:ccc:ddd]) which it established during the original registration.

Table 16.3-1 REGISTER request (UE to P-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>;tag=5ef4
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfg1kj49111
Authorization: eap eap-p=base64(user1_private1@home1.net)
CSeq: 3 REGISTER
Expires: 7200
Content-Length: 0

```

The header field usage is the same as for the initial registration scenario:

- From:** This indicates the public user identity originating the REGISTER request. The public user identity may be obtained from the USIM.
- To:** This indicates public user identity being registered. This is the identity by which other parties know this subscriber.
- Contact:** This indicates the point-of-presence for the subscriber – the IP address of the UE. This is the temporary identifier for the subscriber that is being registered. Subsequent requests destined for this subscriber will be sent to this address. This information is stored in the P-CSCF.

Editor's note: It is for further study whether this information is stored in the HSS and the S-CSCF for the subscriber in order to support multiple registrations.

- Authorization:** It carries authentication information. The private user identity (user1_private1@home1.net) is carried in the user ID field of the extensible authentication protocol (EAP).

NOTE 1: The actual Authorization header value may look like this as it is in base64 form:

- Authorization: eap eap-p=QWxhZGRpbjpvGVuIHNIc2FtZQ==

- Request-URI:** The Request-URI (the URI that follows the method name, "REGISTER", in the first line) indicates the destination domain of this REGISTER request. The rules for routing a SIP request describe how to use DNS to resolve this domain name ("home1.net") into an address or entry point into the home operator's network (the I-CSCF). This information is stored in the USIM.

Upon receiving this request the P-CSCF will detect that it already has a registration record for this UE and will reset its SIP registration timer for this UE to the Expires time in this request.

2. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI. The DNS provides the P-CSCF with an address of the I-CSCF in the home network. The P-CSCF must not use the I-CSCF address cached as a result of the previous registration.

3. REGISTER request (P-CSCF to I-CSCF) – see example in table 16.3-3

This signalling flow shows the REGISTER request being forward from the P-CSCF to the I-CSCF in the home domain.

Table 16.3-3 REGISTER request (P-CSCF to I-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:Call-ID:
Authorization: eap eap-p=base64(user1_private1@home1.net)
CSeq:
Expires:
Content-Length:

```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Require:/Proxy-Require: These headers are included to ensure that the recipient correctly handles the Path header. If the recipient does not support the path header, a response will be received with a status code of 420 and an Unsupported header indicating "path". Such a response indicates a misconfiguration of the routing tables and the request has been routed outside the IM CN subsystem.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

4. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. Because the user has registered, the HSS returns the I-CSCF with the S-CSCF address for the subscriber

For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 3), which are sent to the HSS, see table 6.2-5a.

Table 6.3-4a provides the parameters in the SIP REGISTER request (flow 5), which are obtained from the information sent back from the HSS.

5. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.3-5

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected. The Request-URI is changed to the address of the S-CSCF.

I-CSCF adds a proper I-CSCF name to the Path header.

Table 16.3-5 REGISTER request (I-CSCF to S-CSCF)

```

REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Authorization: eap eap-p=base64(user1_private1@home1.net)
Call-ID:
CSeq:
Expires:
Content-Length:

```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

Upon receiving this request the S-CSCF will detect that it already has a registration record for this UE and will reset its SIP registration timer for this UE to the Expires time in this request.

6. Cx: Authentication procedure

On receiving a REGISTER request from a registered user, the S-CSCF requires at least one authentication vector to be used in the challenge to the user. If a valid AV is not available, then the S-CSCF requests at least one AV from the HSS.

For detailed message flows see 3GPP TS 29.228.

Table 6.3-6a provides the parameters in the REGISTER request (flow 5), which are sent to the HSS.

7. Authentication vector selection

The S-CSCF selects an authentication vector for use in the authentication challenge. For detailed description of the authentication vector, see 3GPP TS 33.203.

NOTE 2: The authentication vector may be of the form 3GPP TS 33.203 (if IMS AKA is the selected authentication scheme):

AV = RANDn||AUTNn||XRESn||CKn||IKn where:

- RAND: random number used to generate the XRES, CK, IK, and part of the AUTN. It is also used to generate the RES at the UE.
- AUTN: Authentication token (including MAC and SQN).
- XRES: Expected (correct) result from the UE.
- CK: Cipher key (optional).
- IK: Integrity key.

8. 401 Unauthorized response (S-CSCF to I-CSCF) – see example in table 16.3-8

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 16.3-8: 401 Unauthorized response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_privatel@home1.net, RAND, AUTN)
CSeq:
Content-Length:
```

NOTE 3: The actual WWW-Authenticate header value may look like this as it is in base64 form:

- WWW-Authenticate: eap eap-p=QWxh4ZGRpb2jpvGVuNlctZQ==

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

9. 401 Unauthorized response (I-CSCF to P-CSCF) – see example in table 16.3-9

The authentication challenge is sent in the 401 Unauthorized response towards the UE.

Table 16.3-9: 401 Unauthorized response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate: eap eap-p=base64(user1_privatel@home1.net, RAND, AUTN)
CSeq:
Content-Length:
```

Editor's Note: The mechanism to transport the session keys (IK and optionally, CK) from the S-CSCF to the P-CSCF is FFS.

10. 401 Unauthorized response (P-CSCF to UE) – see example in table 16.3-10

The P-CSCF removes any keys received in the 401 Unauthorized response and forwards the rest of the response to the UE.

Table 16.3-10: 401 Unauthorized response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

11. Generation of response and session keys at UE

Upon receiving the Unauthorised response, the UE extracts the MAC and the SQN from the AUTN. The UE calculates the XMAC and checks that XMAC matches the received MAC and that the SQN is in the correct range. If both these checks are successful the UE calculates the response, RES, and also computes the session keys IK and CK. The RES is put into the Authorization header and sent back to the registrar in the REGISTER request.

12. REGISTER request (UE to P-CSCF) – see example in table 16.3-12

Table 16.3-12 REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>;tag=5ef4
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfg1kj49112
Authorization: eap eap-p=base64(user1_privatel@home1.net, RES)
CSeq: 4 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 10 along with the private user identity both encoded in base64 format.

13. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI.

The P-CSCF sends the REGISTER request - after local processing - to the address indicated in the Request-URI. When forwarding the REGISTER request the P-CSCF needs to specify the protocol, port number and IP address of the I-CSCF server in the home network to which to send the REGISTER request. The P-CSCF

tries to find this information by querying the DNS. Since the Request-URI does not specify the transport protocol the, P-CSCF selects the UDP.

Table 16.3-13a DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV
```

The DNS records are retrieved according to RFC2782 [4].

Table 16.3-13b DNS Query Response (DNS to P-CSCF)

```
OPCODE=SQUERY, RESPONSE, AA
QNAME=__sip._udp.registrar.home1.net, QCLASS=IN, QTYPE=SRV

_sip._udp.registrar.home1.net          0 IN SRV 1 10 5060 icscf1_p.home1.net
                                       0 IN SRV 1 0 5060 icscf7_p.home1.net

icscf1_p.home1.net                     0 IN AAAA      5555::aba:dab:aaa:daa
icscf7_p.home1.net                     0 IN AAAA      5555::ala:b2b:c3c:d4d
```

In the Answer field of the query-response each I-CSCF is identified by its host domain name. The returned SRV Resource Records (RRs) are merged and ordered, and the selection technique (employing the Priority and Weight parameters returned in the RRs) as specified in RFC 2782 [4] is used to select the I-CSCF (i.e. the icscf1_p.home1.net). Since the Additional Data field of the query-response also contains the IP address of the selected I-CSCF (i.e. 5555::aba:dab:aaa:daa), a new query to the DNS is not required.

Once the IP address of the I-CSCF is obtained, the P-CSCF forwards the REGISTER request to this IP address (i.e. 5555::aba:dab:aaa:daa) using the UDP protocol and port number 5060.

14. REGISTER request (P-CSCF to I-CSCF) – see example in table 16.3-14

This signalling flow shows the REGISTER request being forwarded from the P-CSCF to the I-CSCF in the home domain.

Table 16.3-14 REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

15. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. Because the user has registered, the HSS returns the I-CSCF with the S-CSCF address for the subscriber.

For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 14), which are sent to the HSS, see table 6.2-16a.

Table 6.3-15a provides the parameters in the REGISTER request (flow 16), which are obtained from the information sent back from the HSS.

16. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.3-16

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 16.3-16 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

17. Authentication

Upon receiving the REGISTER request, carrying the authentication response, RES, the S-CSCF checks that the user's active XRES matches the received RES. If the check is successful then the user has been authenticated and the public user identity is registered in the S-CSCF.

18. Cx: S-CSCF registration notification procedure

On registering a user the S-CSCF informs the HSS that the user has been registered at this instance. The HSS stores the S-CSCF name for that subscriber. For a positive response, the HSS will include the user profile in the response sent to the S-CSCF.

For detailed message flows see 3GPP TS 29.228.

For the parameters in the REGISTER request (flow 16), which are sent to HSS, see table 6.2-19a.

19. 200 OK response (S-CSCF to I-CSCF) – see example in table 16.3-19

The S-CSCF sends acknowledgement to the I-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 16.3-19 200 OK response (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact: sip:[5555::aaa:bbb:ccc:ddd]
CSeq:
Date: Wed, 11 July 2001 08:49:37 GMT
Expires: 7200
Content-Length:
```

Path: The S-CSCF inserts its own name to the front of the list.

20. 200 OK response (I-CSCF to P-CSCF) – see example in table 16.3-20

The I-CSCF translates the S-CSCF name in the Path header. The I-CSCF forwards acknowledgement from the S-CSCF to the P-CSCF indicating that Registration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 16.3-20 200 OK response (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:token(scscf1.home1.net)>, <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

21. 200 OK response (P-CSCF to UE) – see example in table 16.3-21

The P-CSCF removes its address from the Path header, reverses the order of the fields, saves the resulting Path header and associates it with the UE. The P-CSCF then removes the Path header from the 200 OK response. The P-CSCF then forwards acknowledgement from the I-CSCF to the UE indicating that Registration was successful.

Table 16.3-21 200 OK response (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:
```

16.4 Registration signalling: mobile initiated deregistration

Figure 16.4-1 shows a signalling flow for mobile initiated deregistration. For the purposes of this deregistration signalling flow, the subscriber is considered to be roaming. In this signalling flow, the home network has configuration hiding active.

This signalling flow assumes:

1. That the same PDP Context allocated during the initial registration scenario is still used for deregistration. For the case when the UE does not still have an active PDP context then PDP context procedures from subclause 16.2 must first be completed.

Editor's Note: If the same PDP-Context is not available, is it guaranteed that the UE will get back the same IP address at this point? If this is not possible, would there be a problem with the binding in the P-CSCF (user_public1@home1.net and [5555::aaa:bbb:ccc:ddd])?

2. The procedure employed for P-CSCF discovery is not needed.
3. The S-CSCF selection procedure invoked by the I-CSCF is not needed.

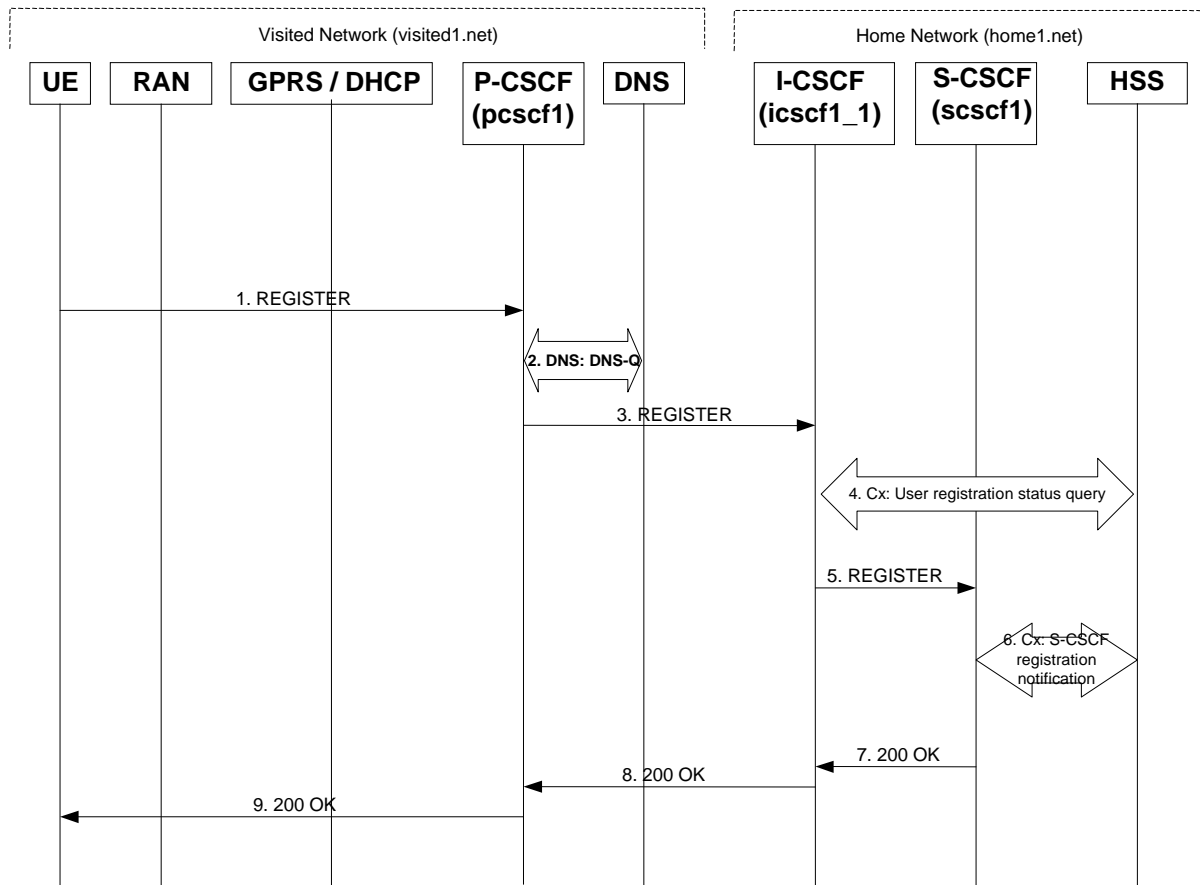


Figure 16.4-1: Registration signalling: mobile initiated deregistration

1. REGISTER request (UE to P-CSCF) – see example in table 16.4-1

The UE intends to de-register itself. It does so by sending a new REGISTER request. This request looks similar as in reregister case, but the Expires header contains zero. This request is sent to the same P-CSCF with which the UE initially registered.

Table 16.4-1 REGISTER (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfgk49111
Authorization: eap eap-p=AQAAEwFqYXJpQGfya2tvLmNvbQ==
CSeq: 7 REGISTER
Expires: 0
Content-Length: 0
```

The header field usage is the same as for the initial registration scenario:

- From:** This indicates the public user identity originating the REGISTER request. The public user identity may be obtained from the USIM.
- To:** This indicates public user identity. This is the identity by which other parties know this subscriber.
- Contact:** This indicates the point-of-presence for the subscriber – the IP address of the UE. This is the temporary identifier for the subscriber that is being de-registered.
- Authorization:** It carries authentication information. The private user identity is carried in the user ID field of the authentication protocol.

Request-URI: The Request-URI (the URI that follows the method name, "REGISTER", in the first line) indicates the destination domain of this REGISTER request. The rules for routing a SIP request describe how to use DNS to resolve this domain name ("home1.net") into an address or entry point into the home operator's network (the I-CSCF). This information is stored in the USIM.

Expires: The 0 value indicates the registration is being cancelled.

Upon receiving this request the P-CSCF will reset the SIP registration timer for this UE to 0.

2. DNS: DNS-Q

Based on the user's URI, the P-CSCF determines that UE is registering from a visiting domain and performs a DNS query to locate the I-CSCF in the home network. The look up in the DNS is based on the address specified in the Request URI. The DNS provides the P-CSCF with an address of the I-CSCF in the home network. The P-CSCF must not use the I-CSCF address cached as a result of the previous registration.

3. REGISTER request (P-CSCF to I-CSCF) – see example in table 16.4-3

This signalling flow shows the REGISTER request being forward from the P-CSCF to the I-CSCF in the home domain.

Table 16.4-3 REGISTER request (P-CSCF to I-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: This is the address of the P-CSCF and is included to inform the S-CSCF where to route terminating sessions.

Require:/Proxy-Require: These headers are included to ensure that the recipient correctly handles the Path header. If the recipient does not support the path header, a response will be received with a status code of 420 and an Unsupported header indicating "path". Such a response indicates a misconfiguration of the routing tables and the request has been routed outside the IM CN subsystem.

Roaming-Info: The *vnid* parameter contains the identifier of the P-CSCF network at the home network.

4. Cx: User registration status query procedure

The I-CSCF requests information related to the Subscriber registration status by sending the private user identity, public user identity and visited domain name to the HSS. Because the user has registered, the HSS returns the I-CSCF with the S-CSCF address for the subscriber

For detailed message flows see 3GPP TS 29.228.

For the parameters in the SIP REGISTER request (flow 3) which are sent to the HSS, see table 6.2-5a.

Table 6.3-4a provides the parameters in the SIP REGISTER request (flow 5) which are obtained from the information sent back from the HSS.

5. REGISTER (I-CSCF to S-CSCF) – see example in table 16.4-5

I-CSCF adds a proper I-CSCF name to the Path header.

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected. The Request-URI is changed to the address of the S-CSCF.

Table 16.4-5 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:icscf1_p.home1.net> <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Upon receiving this request the S-CSCF will reset the SIP registration timer for this UE to 0.

6. Cx: S-CSCF registration notification procedure

The S-CSCF shall notify the HSS to clear its location information for that subscriber. The HSS deletes the S-CSCF name for that subscriber. The HSS sends a response to the S-CSCF to acknowledge the clearing of location information.

For detailed message flows see 3GPP TS 29.228.

For the parameters in the SIP REGISTER request (flow 5), which are sent to the HSS, see table 6.2-7a.

7. 200 OK (S-CSCF to I-CSCF) – see example in table 16.4-7

The S-CSCF sends acknowledgement to the I-CSCF indicating that deregistration was successful. This request will traverse the path that the REGISTER request took as described in the Via list. The S-CSCF clears its information for that subscriber.

Table 16.4-7 200 OK response (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:scscf1.home1.net>, <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
From:
To: <sip:user1_public1@home1.net>
Call-ID: apb03a0s09dkjdfglkj49111
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
CSeq: 3 REGISTER
Date: Wed, 11 July 2001 08:49:37 GMT
Expires: 0
Content-Length: 0
```

Path: The S-CSCF inserts its own name to the front of the list.

8. 200 OK (I-CSCF to P-CSCF) – see example in table 16.4-8

The I-CSCF forwards acknowledgement from the S-CSCF to the P-CSCF indicating that deregistration was successful. This response will traverse the path that the REGISTER request took as described in the Via list.

Table 16.4-8 200 OK response (I-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:token(scscf1.homel.net)>, <sip:icscf1_p.homel.net>, <sip:pcscf1.visited1.net>
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:

```

9. 200 OK (P-CSCF to UE) – see example in table 16.4-9

The P-CSCF forwards the acknowledgement from the I-CSCF to the UE indicating that deregistration was successful. The P-CSCF clears its information for that subscriber after sending the acknowledgement to the UE.

Table 16.4-9 200 OK response (P-CSCF to UE)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
CSeq:
Date:
Expires:
Content-Length:

```

16.5 UE subscription for the registration state event package

This section describes the subscription procedure for the registration states event package, whereby the UE requests to be notified by the S-CSCF when the event has occurred. This is done using the information structure specified for the 'presence' package.

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network has network configuration hiding active. For this example the trigger point at the UE for sending out the SUBSCRIBE request is the 200 OK response of the users registration.

Editor's Note: The interaction between the explicit subscription procedure for the Event: registration-state event package and the registration procedures needs further consideration. For example: What are the appropriate timer values of Expires header for these procedures considering the signalling is over the radio interface? What is the status of the ongoing explicit subscription procedure (Event: registration-state event package) when the registration timer has expired? etc.

Editor's Note: Further clarification with IETF on the setting of Request URI, Remote-Party-ID and To header has to be done. The values of these headers in the SUBSCRIBE and NOTIFY messages, as well as in their responses, as indicated in sections 16.5, 6.5, 16.6 and 6.6 of 24.228 has to be aligned to the outcome of this clarification.

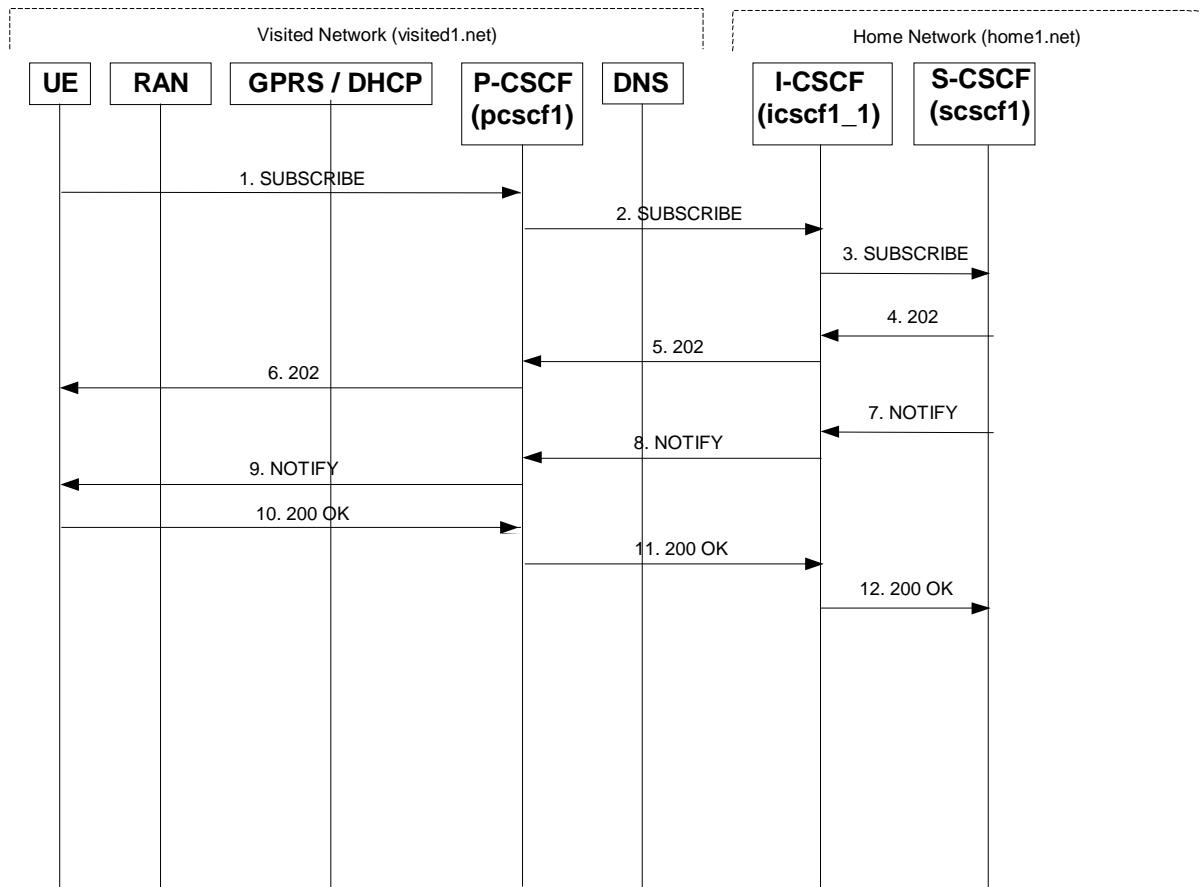


Figure 16.5-1: UE subscription for the registration state event package (with I-CSCF providing configuration independence)

1. SUBSCRIBE request (UE to P-CSCF) – see example in table 16.5-1

The UE generates a SUBSCRIBE request in order to subscribe for the registration-state event package.

The From and To fields both will contain the UE's public address.

Table 16.5-1 SUBSCRIBE request (UE to P-CSCF)

```
SUBSCRIBE sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 SUBSCRIBE
Event: presence
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Content-Length: 0
```

Request URI: Public user identity whose events the subscriber subscribes to. In this case the subscribing user and the monitored user are identical.

From: This field is populated with logical representation (FQDN) for the entity sending the SUBSCRIBE.

Event: This field is populated with the value 'presence' to specify the use of the presence package.

Accept: This field is populated with the value 'application/cpim-pidf+xml' in keeping with the use of the 'presence' package.

- To:** Same as the Request-URI.
- Contact:** The contact information of the subscribing user.

2. SUBSCRIBE request (P-CSCF to I-CSCF) – see example in table 16.5-2

P-CSCF looks up the serving network information for the public user identity that was stored during the registration procedure. The SUBSCRIBE request is forwarded to I-CSCF. A Route header is inserted into SUBSCRIBE request. The information for the Route header is taken from the path header as gathered during registration.

Table 16.5-2 SUBSCRIBE request (P-CSCF to I-CSCF)

```
SUBSCRIBE sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip: token(scscf1.home1.net), sip:user1_public1@home1.net
Record-Route: sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
```

- Route:** The Route: header is populated with the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

3. SUBSCRIBE (I-CSCF to S-CSCF) – see example in table 16.5-3

I-CSCF determines the S-CSCF name in the Route header field to retrieve the routing information. I-CSCF then forwards the SUBSCRIBE request to S-CSCF.

Table 16.5-3 SUBSCRIBE (I-CSCF to S-CSCF)

```
SUBSCRIBE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:user1_public1@home1.net
Record-Route: sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
```

4. 202 Accepted response (S-CSCF to I-CSCF) – see example in table 16.5-4

The S-CSCF sends an acknowledgement towards the UE indicating that the subscription was successful. This response will traverse the path that the SUBSCRIBE request took as described in the Via list.

NOTE 1: If the S-CSCF can process the SUBSCRIBE request and send the NOTIFY request immediately, it can send a 200 OK response instead of a 202 Accepted response.

Table 16.5-4 202 Accepted response (S-CSCF to I-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:351g45.1@icscf1_p.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Contact: sip:user1_public1@scscf1.home1.net
Event:
Expires:
Content-Length:
```

Expires: If value of the Expires header in SUBSCRIBE request is different from the one received in REGISTER method, then the value of Expires header in 202 Accepted is set to match the value of Expires header in REGISTER method.

Contact: This is populated with a identifier generated within the S-CSCF that will help it correlate refreshes for the SUBSCRIBE. It is assumed to be the public-id 'user1_public1' in this case.

5. 202 Accepted response (I-CSCF to P-CSCF) – see example in table 16.5-5

I-CSCF forwards 202 Accepted response to P-CSCF.

Table 16.5-5 202 Accepted response (I-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:token(scscf1.home1.net), sip:351g45.1@icscf1_p.home1.net,
    sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Event:
Contact: sip:token(user1_public1@scscf1.home1.net)Expires:
Content-Length:
```

6. 202 Accepted response (P-CSCF to UE) – see example in table 16.5-6

P-CSCF sends the response to UE.

Table 16.5-6 202 Accepted response (P-CSCF to UE)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Event:
Contact:
Expires:
Content-Length:
```

7. NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.5-7

The S-CSCF sends a first NOTIFY request towards the UE in order to inform the UE about the registration status of the monitored user.

In the example below, the NOTIFY specifies the following public user identities as registered (i.e. status=open): sip:user1_public1@home1.net, tel: +498972233114;

The following public user identity has been de-registered (i.e. status=closed) sip:user1_public2@home1.net. They are arranged in the preferred order of priority in this example.

The Route header is constructed from the information saved at registration.

Table 16.5-7 NOTIFY request (S-CSCF to I-CSCF)

```
NOTIFY sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: sip:240f34.1@pcscf1.visited1.net, sip:[5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID:
CSeq: 42 NOTIFY
Contact: sip:user1_public1@scscf1.home1.netExpires:
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

  <tuple name="sip:user1_public1@home1.net">
    <status><value>open</value></status>
  </tuple>

  <tuple name="sip:user1_public2@home1.net">
    <status> <value>closed</value> </status>
  </tuple>

  <tuple name="tel:+498972233114">
    <status><value>open</value></status>
  </tuple>

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE

Content-Type: Set to the value of the Accept: header received in the subscribe or 'application/cpim-pidf+xml' if Accept: was not present in the SUBSCRIBE:

- The message body in the NOTIFY request that carries the subscriber's registration state is of the following form.
- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.
- The <presence> element consist of one or more <tuple> elements and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload.
- Each <tuple> element carries the registration state of a single public-id and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries a mandatory <value> = open|closed and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.

NOTE 2: The registration states in 3GPP are mapped as follows to the status values in the presence-package:

- Open (status value) is mapped to Registered (3GPP).
- Closed (status value) is mapped to De-Registered (3GPP).

Editor's Note: further mappings of status values to 3GPP are for future study

- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'.

8. NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.5-8

I-CSCF translates the S-CSCF address in the Via header and forwards NOTIFY to P-CSCF.

Table 16.5-8 NOTIFY request (I-CSCF to P-CSCF)

```

NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(scscf1.home1.net)
Route: sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact: sip:token(user1_public1@scscf1.home1.net)Expires:
Event:
Content-Type:
Content-Length:

```

9. NOTIFY request (P-CSCF to UE) – see example in table 16.5-9

P-CSCF sends NOTIFY to the user.

Table 16.5-9 NOTIFY request (P-CSCF to UE)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq: Contact:
Expires:
Event:
Content-Type:
Content-Length:

```

10. 200 OK response (UE to P-CSCF) – see example in table 16.5-10

UE responds with 200 OK.

Table 16.5-10 200 OK response (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. 200 OK response (P-CSCF to I-CSCF) – see example in table 16.5-11

P-CSCF forwards the 200 OK to I-CSCF.

Table 16.5-11 200 OK response (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Content-Length:

```

12. 200 OK response (I-CSCF to S-CSCF) – see example in table 16.5-12

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification is reached to the user.

Table 16.5-12 200 OK response (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

16.6 P-CSCF subscription for the registration state event package

This subclause describes the subscription procedure for the registration state event package, whereby the P-CSCF requests to be notified by the S-CSCF when the event has occurred. This is done using the 'presence' package.

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network has network configuration hiding active. For this example the trigger point at the P-CSCF for sending out the SUBSCRIBE request is the 200 OK response of the users registration.

Editor's Note: The interaction between the explicit subscription procedure for the Event: registration-state event package and the registration procedures needs further consideration. For example: What are the appropriate timer values of Expires header for these procedures considering the signalling is over the radio interface? What is the status of the ongoing explicit subscription procedure (Event: registration-state event package) when the registration timer has expired? etc.

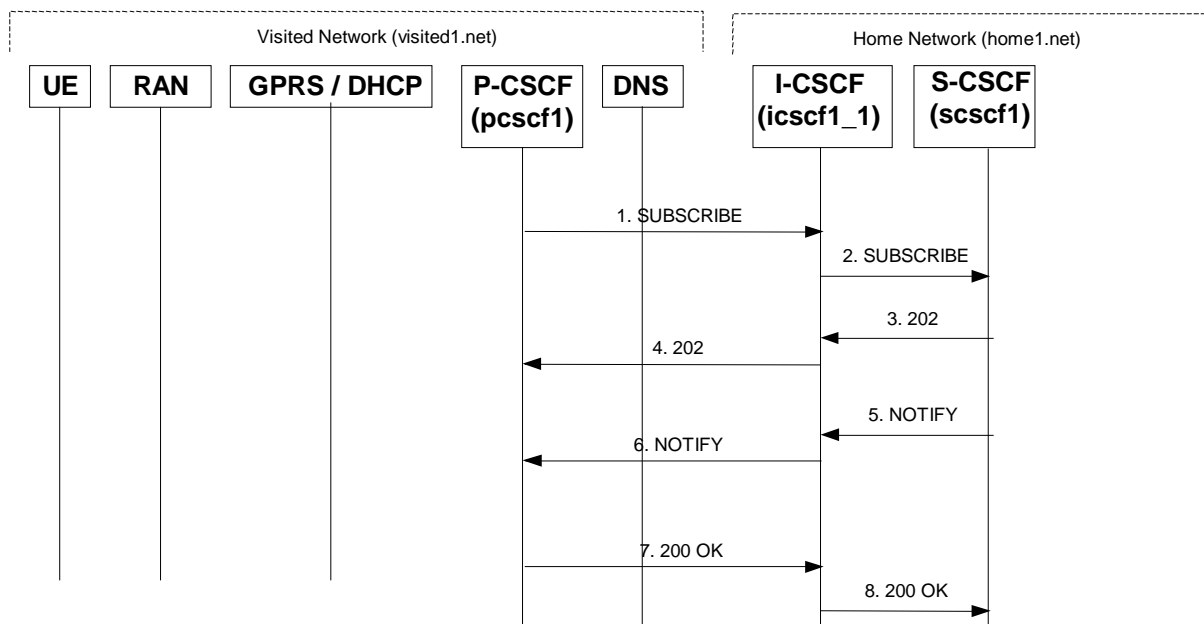


Figure 16.6-1: P-CSCF subscription for the registration state event package (with I-CSCF providing configuration independence)

1. SUBSCRIBE request (P-CSCF to S-CSCF) – see example in table 16.6-1

The P-CSCF generates a SUBSCRIBE request in order to subscribe for the registration-state event package.

The route is constructed from the monitored users path header as constructed during registration.

Table 16.6-1 SUBSCRIBE request (P-CSCF to I-CSCF)

```

SUBSCRIBE sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Route: sip:token(scscf1.home1.net)
From: <sip:pcscf1.visited1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: 223456789@pcscf1.visited1.net
CSeq: 61 SUBSCRIBE
Event: presence
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:user1_public1%40home1.net@pcscf1.visited1.net>
Content-Length: 0

```

- Request URI:** The next hop on the route to the destination as recorded in the path information for the monitored user during registration.
- Route:** The token containing a representation of the S-CSCF allocated to this user, based on the registration information.
- From:** This header is populated with the SIP URI that identifies the P-CSCF.
- To:** The SIP-URI of the entity which provides information about the monitored users registration states. In this case this is the address of the registrar of user1_public1.
- Contact:** This is where the NOTIFY requests for this subscription will be sent. It consists of the SIP URL-escaped public user identity at the P-CSCF.
- Event:** This field shall be set to the value 'presence' to specify the use of the presence package
- Accept:** This field shall be set to the value 'application/cpim-pidf+xml' in keeping with the use of the 'presence' package.

2. SUBSCRIBE (I-CSCF to S-CSCF) – see example in table 16.6-2

I-CSCF determines the S-CSCF name in the Route header field to retrieve the routing information. I-CSCF then forwards the SUBSCRIBE request to S-CSCF.

Table 16.6-2 SUBSCRIBE (I-CSCF to S-CSCF)

```

SUBSCRIBE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Record-Route: sip:351g45.1@icscf1_p.home1.net
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:

```

- Record-Route:** The ICSCF adds a route header as it wants to stay on the routing path for network hiding purposes.

3. 202 Accepted response (S-CSCF to I-CSCF) – see example in table 16.6-3

The S-CSCF sends an acknowledgement towards the P-CSCF indicating that the subscription was successful. This response will traverse the path that the SUBSCRIBE request took as described in the Via list.

NOTE 1: If the S-CSCF can process the SUBSCRIBE request and send the NOTIFY request immediately, it can send a 200 OK response instead of a 202 Accepted response.

Table 16.6-3 202 Accepted response (S-CSCF to I-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Record-Route: sip:332b23.1@scscf1.home1.net, sip:351g45.1@icscf1_p.home1.net,
             sip:240f34.1@pcscf1.visited1.net
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Contact: sip:user1_public1@scscf1.home1.netEvent:
Expires:
Content-Length:
```

4. 202 Accepted response (I-CSCF to P-CSCF) – see example in table 16.6-4

I-CSCF forwards 202 Accepted response to P-CSCF.

Table 16.6-4 202 Accepted response (I-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
Record-Route: sip:token(scscf1.home1.net), sip:351g45.1@icscf1_p.home1.net
From:
To:
Call-ID:
CSeq:
Contact: sip:token(user1_public1@scscf1.home1.net)Event:
Expires:
Content-Length:
```

5. NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.6-5

The S-CSCF sends a first NOTIFY request towards the P-CSCF in order to inform the P-CSCF about the registration status of the monitored user.

The Route header is constructed from the Record-Route header as constructed during subscription.

Table 16.6-5 NOTIFY request (S-CSCF to I-CSCF)

```
NOTIFY sip:user1_public1%40home1.net@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: sip:240f34.1@pcscf1.visited1.net
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@pcscf1.visited1.net>;tag=31415
Call-ID:
CSeq: 42 NOTIFY
Contact: sip:user1_public1@scscf1.home1.netExpires:
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

    <tuple name="sip:user1_public1@home1.net">
        <status><value>closed</value></status>
    </tuple>

</presence>
```

Request-URI: The contents are the same as the Contact header in the SUBSCRIBE.

From: The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE

Content-Type: Set to the value of the Accept: header received in the subscribe or 'application/cpim-pidf+xml' if Accept: was not present in the SUBSCRIBE

The message body in the NOTIFY request that carries the subscriber's registration state is of the following form:

- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.
- The <presence> element consist of one or more <tuple> elements and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload.
- Each <tuple> element carries the registration state of a single public-id and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries a mandatory <value> = open|closed and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.

NOTE 2: the registration states in 3GPP are mapped as follows to the status values in the presence-package:

- Open (status value) is mapped to Registered (3GPP).
- Closed (status value) is mapped to De-Registered (3GPP).

Editor's Note: further mappings of status values to 3GPP are for future study

- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'.

6. NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.6-6

I-CSCF translates the S-CSCF address in the Via header and forwards NOTIFY to P-CSCF.

Table 16.6-6 NOTIFY request (I-CSCF to P-CSCF)

```
NOTIFY sip:user1_public1%40home1.net@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(scscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Expires:
Event:
Content-Type:
Content-Length:
```

7. 200 OK response (P-CSCF to I-CSCF) – see example in table 16.6-7

P-CSCF forwards the 200 OK to I-CSCF.

Table 16.6-7 200 OK response (P-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. 200 OK response (I-CSCF to S-CSCF) – see example in table 16.6-8

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification is reached to the user.

Table 16.6-8 200 OK response (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

16.7 Notifying of the network initiated deregistration event (not provided)

16.8 Network initiated re-authentication

This subclause describes the notification of a user about the re-authentication event that occurs at the S-CSCF assigned to that user in the case where the users home network provides network configuration hiding.

It is assumed that user has registered and also subscribed to the registration state event before. Also, the subscriber is considered to be roaming and the home network operator does not desire to keep its internal configuration hidden from the visited network.

After this procedure the users UE might automatically initiated re-registration procedures.

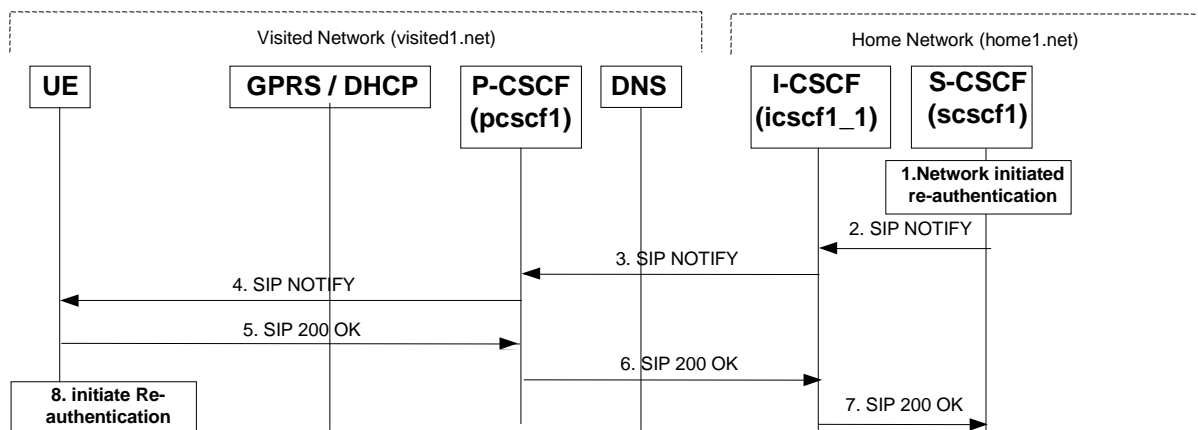


Figure 16.8-1: S-CSCF informs UE that network initiated re-authentication is needed (with I-CSCF providing configuration independence)

1. Network initiated re-authentication (S-CSCF)

The network-initiated re-authentication event for the private user identity user occurs at the S-CSCF. As the user has subscribed to the registration state event package this is the trigger point for the S-CSCF to notify the user about the event occurrence.

2. SIP NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.8-2

The S-CSCF sends a NOTIFY request towards the UE in order to inform the UE about the occurrence of the network initiated re-authentication event.

The Route header is constructed from the information saved at registration.

Table 16.8-2 SIP NOTIFY request (S-CSCF to I-CSCF)

```

NOTIFY sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: sip:240f34.1@pcscf1.visited1.net, sip:[5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID: 223456789@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Expires: 7200
Event: presence
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="http://www.ietf.org/ns/cpim-pidf-xml-1.0">

    <tuple name="sip:user1_public1@home1.net">
        <status><value>re-authenticate</value></status>
    </tuple>
</presence>

```

From: The tag of this field matches that of the To; field in the received 200/202 for the SUBSCRIBE

Content-Type: Set to the value of the Accept: header received in the subscribe or 'application/cpim-pidf+xml' if Accept: was not present in the SUBSCRIBE

The message body in the NOTIFY request that carries the subscriber's registration state is of the following form:

- The registration state is expressed in XML with the information enclosed in the root <presence> element, enclosed between <presence> and </presence> tags.
- The <presence> element consist of only one <tuple> element and an optional <timestamp>. It contains a mandatory xmlns attribute that specifies the namespace for this version of the registration-information payload.
- The <tuple> element carries the registration state the public-id and carries a mandatory 'name' attribute. The <tuple> element carries mandatory <status> element and optional <contact> and <note> elements.
- The <status> element carries the <value> = re-authenticate and an optional <detail> element. The <contact> element carries any updated contact information (with priority). The <note> is human-readable for extra details.
- The optional <detail> element carries a mandatory 'type' attribute and an optional schema that is usually a DTD related to the specified 'type'.

3. SIP NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.8-3

I-CSCF translates the S-CSCF address in the Via header and forwards NOTIFY to P-CSCF.

Table 16.8-3 SIP NOTIFY request (I-CSCF to P-CSCF)

```

NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1)
Route: sip:[5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From:
To:
Call-ID:
Cseq:
Expires:
Event:
Content-Type:
Content-Length:

```

4. SIP NOTIFY request (P-CSCF to UE) – see example in table 16.8-4

P-CSCF sends NOTIFY to the user.

Table 16.8-4 SIP NOTIFY request (P-CSCF to UE)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq: Expires:
Event:
Content-Type:
Content-Length:

```

5. SIP 200 OK response (UE to P-CSCF) – see example in table 16.8-5

UE responds with 200 OK.

Table 16.8-5 SIP 200 OK response (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. SIP 200 OK response (P-CSCF to I-CSCF) – see example in table 16.8-6

P-CSCF forwards the 200 OK to I-CSCF.

Table 16.8-6 SIP 200 OK response (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1)
From:
To:
Call-ID:
CSeq:
Content-Length:

```

7. SIP 200 OK response (I-CSCF to S-CSCF) – see example in table 16.8-7

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification is reached to the user.

Table 16.8-7 SIP 200 OK response (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

8. Re-authentication (UE)

The UE shall now initiate the re-authentication procedures.

16.9 Registration error conditions

16.9.1 Reregistration – failure of reregistration

This signalling flow (see figure 16.9.1-1) is a continuation of the signalling flow in subclause 16.3 after reception of signalling flow 4. This signalling flow shows the recovery after a failure of the S-CSCF that had been assigned to the subscriber in a previous registration.

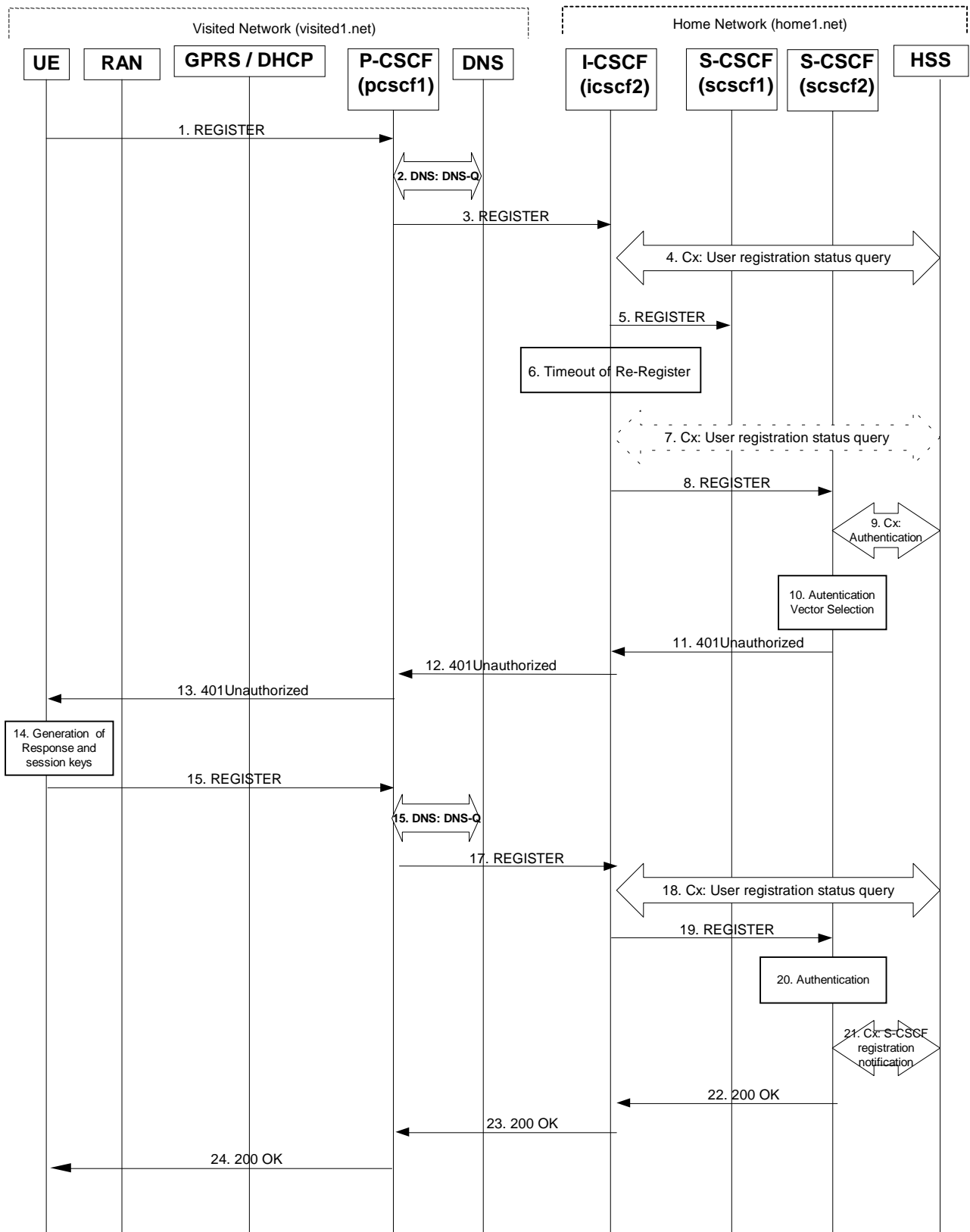


Figure 16.9.1-1: Failure of previous S-CSCF during reregistration

Steps 1 through 4 are the same as the signalling flow in subclause 16.3.

5 REGISTER request (I-CSCF to S-CSCF) – see example in table 16.9.1-5

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected. The Request-URI is changed to the address of the S-CSCF.

I-CSCF adds a proper I-CSCF name to the Path header.

Table 16.9.1-5 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfgk49111
Authorization: eap eap-p=AQAAEwFqYXJpQGFya2tvLmNvbQ==
CSeq: 10 REGISTER
Expires: 7200
Content-Length: 0
```

6 Timeout of reregister

The I-CSCF times out, waiting for the response from the S-CSCF.

Editor's Note: The value of the timer in this particular instance is FFS. Clearly the value of the timers in the P-CSCF and UE waiting for the response must be considered when choosing this value.

7 Cx: User registration status query (Optional)

The I-CSCF informs the HSS that the S-CSCF for the subscriber is unreachable and requests information related to the required S-CSCF capabilities from the HSS. The HSS sends the capability information required for S-CSCF selection. The I-CSCF uses this information to select a suitable S-CSCF.

This step is optional. Depending on implementation, sufficient information may be available to the I-CSCF from Step 4, to allow the I-CSCF select an alternate S-CSCF. Alternative mechanisms (for example a CSCF management plane) would be used to enable the HSS learn of S-CSCF failure. In addition, the HSS will learn about the assignment of a new S-CSCF in Step 9.

8 REGISTER (I-CSCF to S-CSCF) – see example in table 16.9.1-8

This signalling flow forwards the REGISTER request from the I-CSCF to the newly selected S-CSCF. The Request-URI is changed to the address of the new S-CSCF.

Table 16.9.1-8 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf2.home1.net SIP/2.0
Via:
Via:
Via:
Path:
Path:
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

The next ten steps (9 to 18) are the same as in the normal reregistration case (steps 6 to 12 in subclause 16.3).

19. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.9.1-9

This signalling flow forwards the REGISTER request from the I-CSCF to the S-CSCF selected.

Table 16.9.1-9 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

Path: The S-CSCF stores the contents of the Path headers and uses these addresses for routing mobile terminated sessions.

The remaining steps (20-25) are the same as in the normal reregistration case (steps 17-22 in subclause 16.3)

17 Signalling flows for session initiation (hiding)

Editor's Note: The 200 OK responses for an INVITE should carry SDP. Future versions of this specification should correct these flows.

17.1 Introduction

See subclause 7.1.

17.2 Origination Procedures

17.2.1 Introduction

See subclause 7.2.1.

17.2.2 MO#1b

17.2.2.1 (MO#1b) Mobile origination, roaming (S-S#2, MT#2 assumed)

Figure 17.2.2.1-1 shows an origination procedure which applies to roaming subscribers when the home network operator desires to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure. During registration, the home network allocates an S-CSCF. The home network advertises an I-CSCF as the entry point from the visited network, who forwards requests to the S-CSCF.

When registration is complete, P-CSCF knows the name/address of the next hop in the signalling path toward the S-CSCF, the I-CSCF. I-CSCF receives information in the request, from which it determines the name/address of the proper S-CSCF.

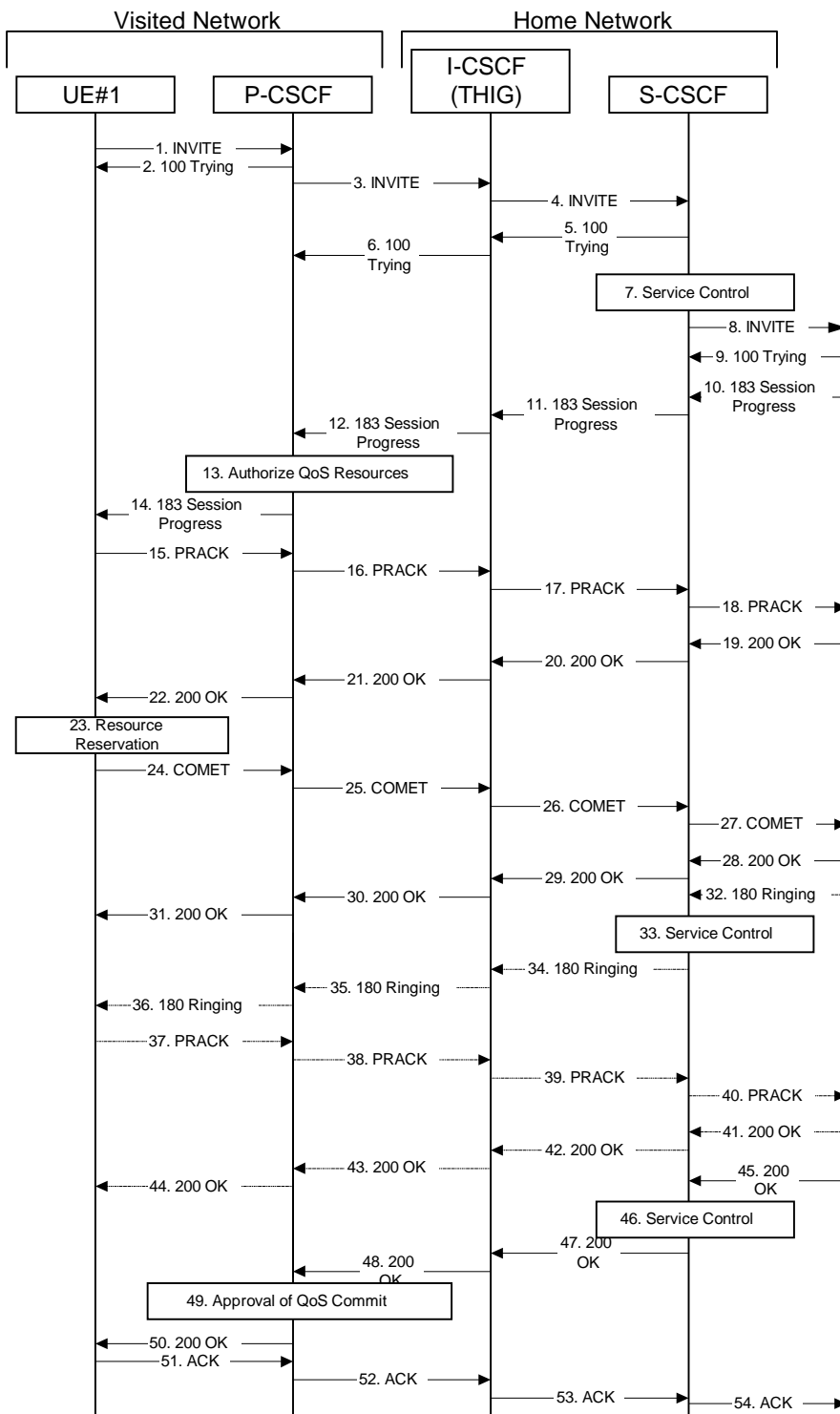


Figure 17.2.2.1-1: MO#1b

Procedure MO#1b is as follows:

1. INVITE (UE to P-CSCF) – see example in table 17.2.2.1-1

UE#1 determines the complete set of codecs that it is capable of supporting for this session. It builds a SDP containing bandwidth requirements and characteristics of each, and assigns local port numbers for each possible media flow. Multiple media flows may be offered, and for each media flow (m= line in SDP), there may be multiple codec choices offered.

For this example, assume UE#1 is capable of sending two simultaneous video streams, either H261 or MPV format, and two simultaneous audio streams, either AMR, G726-32, PCMU, or G728.

UE sends the INVITE request, containing an initial SDP, to the P-CSCF determined via the CSCF discovery mechanism. An example is contained in table 17.2.2.1-1.

Table 17.2.2.1-1: INVITE (UE to P-CSCF)

```

INVITE sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 98 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

Request-URI:	Contains the keyed number from the user. This is specified by the UE as sip:<keyed number>@home1.net. This is in accordance to standard IETF procedures for specifying dialled digits.
Via:	Contains the IP address or FQDN of the originating UE.
Remote-Party-ID:	Contains the public user identity. The Display name is optional.
From:/To:/Call-ID:	Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
Cseq:	Is a random starting number.
Contact:	Is the IP address or FQDN of the originating UE.
SDP	The SDP contains et of codecs supported by UE#1 and desired by the user at UE#1 for this session

Upon receiving the INVITE, the P-CSCF stores the following information about this session, for use in possible error recovery actions – see example in table 17.2.2.1-1b:

Table 17.2.2.1-1b: Storage of information at P-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone

```

```
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact(local): sip:[5555::aaa:bbb:ccc:ddd]
```

2. 100 Trying (P-CSCF to UE) – see example in table 17.2.2.1-2

P-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.2.2.1-2: 100 Trying (P-CSCF to UE)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. INVITE (P-CSCF to I-CSCF) – see example in table 17.2.2.1-3

P-CSCF remembers (from the registration procedure) the request routing for this UE. This becomes the Request-URI in the request. This next hop is the I-CSCF within the home network of UE#1.

P-CSCF adds itself to the Record-Route header and Via header.

P-CSCF#1 examines the media parameters, and removes any choices that the network operator decides based on local policy, not to allow on the network.

For this example, assume the network operator disallows H261 video encoding.

The INVITE request is forwarded through this I-CSCF to the S-CSCF.

Table 17.2.2.1-3: INVITE (P-CSCF to I-CSCF)

```

INVITE sip:icscf1_p.homel.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:240f34.1@pcscf1.visited1.net
Route: sip:Token(scscf1.homel.net), sip:+1-212-555-2222@homel.net;user=phone
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Route: Contains the remaining elements from the Path header from Registration, with the initial Request-URI (received from the UE) appended as the final component.

Request-URI: The first component in the remembered Path header from Registration.

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams no longer list code 98 (H261).

4. INVITE (I-CSCF to S-CSCF) – see example in table 17.2.2.1-4

I-CSCF adds itself to the Record-Route header, and adds a Via header.

I-CSCF determines the routing information contained in the request, and forwards the request to S-CSCF that is serving the UE.

Table 17.2.2.1-4: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
m=
b=
a=
a=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=

```

Upon receiving the INVITE, the S-CSCF stores the following information about this session, for use in possible error recovery actions – see example in table 17.2.2.1-4b:

Table 17.2.2.1-4b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfg1kj490333
Seq: 127 INVITE
Contact (local): sip:[5555::aaa:bbb:ccc:ddd]

```

5. 100 Trying (S-CSCF to I-CSCF) – see example in table 17.2.2.1-5

S-CSCF responds to the INVITE request (4) with a 100 Trying provisional response.

Table 17.2.2.1-5: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```


6. 100 Trying (I-CSCF to P-CSCF) – see example in table 17.2.2.1-6

I-CSCF forwards the 100 Trying provisional response to P-CSCF.

Table 17.2.2.1-6: 100 Trying (I-CSCF to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7. Service Control

S-CSCF validates the service profile, and performs any origination service control required for this subscriber.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

8. INVITE (MO#1b to S-S) – see example in table 17.2.2.1-8

S-CSCF forwards the INVITE request, as specified by the S-CSCF to S-CSCF procedures.

Editor's Note: Need for additional headers to transport e.g. Billing-Correlation-Identifier is FFS.

Table 17.2.2.1-8: INVITE (MO#1b to S-S)

```
INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:351g45.1@icscf1_p.home1.net,
sip:240f34.1@pcscf1.visited1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Request-URI: In the case where the Route header of the incoming INVITE request to S-CSCF contains a TEL-URL [5], it has to be translated to a globally routable SIP-URL before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF shall use the services of an ENUM-DNS protocol according to RFC 2916 [6], or any other suitable translation database. Database aspects of ENUM are outside the scope of this specification.

9. 100 Trying (S-S to MO#1b) – see example in table 17.2.2.1-9 (related to 17.2.2.1-8)

S-CSCF receives a 100 Trying provisional response, as specified by the S-CSCF to S-CSCF procedures.

Table 17.2.2.1-9: 100 Trying (S-S to MO#1b)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. 183 Session Progress (S-S to MO#1b) – see example in table 17.2.2.1-10 (related to 17.2.2.1-8)

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response (to (8)), per the S-CSCF to S-CSCF procedures.

Table 17.2.2.1-10: 183 Session Progress response (S-S to MO#1b)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
Remote-Party-ID: John Smith <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

11. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 17.2.2.1-11

S-CSCF forwards the 183 Session Progress response to I-CSCF.

Table 17.2.2.1-11: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

12. 183 Session Progress (I-CSCF to P-CSCF) – see example in table 17.2.2.1-12

I-CSCF forwards the 183 Session Progress response to P-CSCF.

Table 17.2.2.1-12: 183 Session Progress (I-CSCF to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:Token(scscf2.home1.net, scscf1.home1.net),
    sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

Record-Route: Header entries to the left of I-CSCF's entry are reversed and translated.

Upon receiving the 183 Session Progress, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is as shown table 17.2.2.1-12b:

Table 17.2.2.1-12b: Storage of information at P-CSCF

```
Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 127 INVITE
Contact(local): sip:[5555::aaa:bbb:ccc:ddd]
Route: sip:351g45.1@icscf1_p.home1.net,
    sip:Token(scscf1.home1.net, sip:scscf2.home1.net),
    pcscf2.home1.net
```

13. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session.

14. 183 Session Progress (P-CSCF to UE) – see example in table 17.2.2.1-14

P-CSCF forwards the 183 Session Progress response to the originating endpoint.

Table 17.2.2.1-14: 183 Session Progress (P-CSCF to UE)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373200
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

15. PRACK (UE to P-CSCF) – see example in table 17.2.2.1-15

UE decides the final set of media streams for this session, and includes this information in the PRACK request to P-CSCF.

Table 17.2.2.1-15: PRACK (UE to P-CSCF)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgklkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

- Request-URI:** Takes the value of the Contact header of the received 183 Session Progress response.
- Via:** Take the value of either the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameter.
- Cseq:** Takes a higher value than that in the previous request.

The final selection of the media stream from the set of those supported by the terminating endpoint, given in the received 183 Session Progress response (14), is made by the originating UE and included in the SDP.

16. PRACK (P-CSCF to I-CSCF) – see example in table 17.2.2.1-16

P-CSCF adds the Route header corresponding to the session.

P-CSCF forwards the PRACK request to I-CSCF.

Table 17.2.2.1-16: PRACK (P-CSCF to I-CSCF)

```

PRACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcsf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf1.home1.net, scscf2.home1.net), sip:pcscf2.home1.net,
      sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

- Request-URI:** Taken from the first component of the saved Route header.

Route: Saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

17. PRACK (I-CSCF to S-CSCF) – see example in table 17.2.2.1-17

I-CSCF determines the routing information, and forwards the PRACK request to S-CSCF.

Table 17.2.2.1-17: PRACK (I-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:scscf2.home1.net, sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

18. PRACK (MO#1b to S-S) – see example in table 17.2.2.1-18

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 17.2.2.1-18: PRACK (MO#1b to S-S)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: The first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

19. 200 OK (S-S to MO#1b) – see example in table 17.2.2.1-19 (related to 17.2.2.1-18)

The destination endpoint responds to the PRACK request (18) with a 200 OK response, per the S-CSCF to S-CSCF procedures.

Table 17.2.2.1-19: 200 OK (S-S to MO#1b)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

20. 200 OK (S-CSCF to I-CSCF) – see example in table 17.2.2.1-20

S-CSCF forwards the 200 OK response to I-CSCF.

Table 17.2.2.1-20: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

21. 200 OK (I-CSCF to P-CSCF) – see example in table 17.2.2.1-21

I-CSCF forwards the 200 OK response to P-CSCF.

Table 17.2.2.1-21: 200 OK (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

22. 200 OK (P-CSCF to UE) – see example in table 17.2.2.1-22

P-CSCF forwards the 200 OK response to UE.

Table 17.2.2.1-22: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

23. Resource Reservation

After determining the final media streams in step #14, UE initiates the reservation procedures for the resources needed for this session.

24. COMET (UE to P-CSCF) – see example in table 17.2.2.1-24

When the resource reservation is completed, UE sends the COMET request to the terminating endpoint, via the signalling path established by the INVITE request. The request is sent first to P-CSCF.

Table 17.2.2.1-24: COMET (UE to P-CSCF)

```
COMETsip:[5555::eee:fff:aaa:bbb]SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15
```

- Request-URI:** Takes the value of the Contact header of the received 183 Session Progress response.
- Via:** Take the value of either the IP address or FQDN of the originating UE.
- From:/To:/Call-ID:** Copied from the 183 Session Progress response so that they include any tag parameters.
- Cseq:** Takes a higher value than that in the previous request.

The SDP indicates that the resource reservation was successful.

25. COMET (P-CSCF to I-CSCF) – see example in table 17.2.2.1-25

P-CSCF adds a Route header, with the saved value from the previous response. P-CSCF identifies the proper saved value by the Request-URI.

P-CSCF forwards the COMET request to I-CSCF.

Table 17.2.2.1-25: COMET (P-CSCF to I-CSCF)

```

COMET sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf1.home1.net, scscf2.home1.net), sip:pcscf2.home1.net,
      sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Request-URI: Taken from the first component of the saved Route header.

Route: Saved from the 183 Session Progress response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

26. COMET (I-CSCF to S-CSCF) – see example in table 17.2.2.1-26

I-CSCF determines the routing information, and forwards the request to S-CSCF.

Table 17.2.2.1-26: COMET (I-CSCF to S-CSCF)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:scscf2.home1.net, sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

27. COMET (MO#1b to S-S) – see example in table 17.2.2.1-27

S-CSCF forwards the COMET request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 17.2.2.1-27 COMET (MO#1b to S-S)

```

COMET sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.home1.net,sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
m=

```

Request-URI: The first component of the Route header. This will vary according to which S-CSCF to S-CSCF signalling flow is used.

28. 200 OK (S-S to MO#1b) – see example in table 17.2.2.1-28 (related to 17.2.2.1-27)

The destination endpoint responds to the COMET request (27) with a 200 OK, per the S-CSCF to S-CSCF procedures.

Table 17.2.2.1-28: 200 OK (S-S to MO#1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

29. 200 OK (S-CSCF to I-CSCF) – see example in table 17.2.2.1-29

S-CSCF forwards the 200 OK response to I-CSCF.

Table 17.2.2.1-29 200 OK (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

30. 200 OK (I-CSCF to P-CSCF) – see example in table 17.2.2.1-30

I-CSCF forwards the 200 OK response to P-CSCF.

Table 17.2.2.1-30: 200 OK (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Record-Route: Entries to the left of I-CSCF's entry are reversed and translated.

31. 200 OK (P-CSCF to UE) – see example in table 17.2.2.1-31

P-CSCF forwards the 200 OK response to UE.

Table 17.2.2.1-31: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

32. 180 Ringing (S-S to MO#1b) – see example in table 17.2.2.1-32 (related to 17.2.2.1-8)

The called UE may optionally perform alerting. If so, it signals this to the calling party by a 180 Ringing provisional response to (8). This response is sent to S-CSCF per the S-CSCF to S-CSCF procedure.

Table 17.2.2.1-32: 180 Ringing (S-S to MO#1b)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

33. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

34. 180 Ringing (S-CSCF to I-CSCF) – see example in table 8.1.2-34

S-CSCF forwards the 180 Ringing response to I-CSCF.

Table 17.2.2.1-34: 180 Ringing (S-CSCF to I-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

35. 180 Ringing (I-CSCF to P-CSCF) – see example in table 17.2.2.1-35

I-CSCF forwards the 180 Ringing response to P-CSCF.

Table 17.2.2.1-35: 180 Ringing (I-CSCF to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:Token(scscf2.home1.net, scscf1.home1.net),
sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Record-Route: Entries to the left of I-CSCF's entry are reversed and translated.

36. 180 Ringing (P-CSCF to UE) – see example in table 17.2.2.1-36

P-CSCF removes the Record-Route headers.

P-CSCF forwards the 180 Ringing response to UE.

Table 17.2.2.1-36: 180 Ringing (P-CSCF to UE)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Editor's Note: Additional QoS interactions to handle one-way media at this point (e.g. for PSTN ringback and announcements) is for further study.

37. PRACK (UE to P-CSCF) – see example in table 17.2.2.1-37

UE indicates to the originating subscriber that the destination is ringing. It acknowledges the 180 Ringing provisional response (36) with a PRACK request.

Table 17.2.2.1-37: PRACK (UE to P-CSCF)

```
PRACK sip:[5555::eee:fff:aaa:bbb]SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgk490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

Request-URI: Takes the value of the Contact header of the 180 Ringing response.

Via: Take the value of either the IP address or FQDN of the UE.

From:/To:/Call-ID: Copied from the 180 Ringing response so that they include any revised tag parameters.

Cseq: Takes a higher value than in the previous request.

38. PRACK (P-CSCF to I-CSCF) – see example in table 17.2.2.1-38

P-CSCF adds the Route header corresponding to the session, P-CSCF forwards the PRACK request to I-CSCF.

Table 17.2.2.1-38: PRACK (P-CSCF to I-CSCF)

```

PRACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf1.home1.net, scscf2.home1.net), sip:pcscf2.home1.net,
      sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

39. PRACK (I-CSCF to S-CSCF) – see example in table 17.2.2.1-39

I-CSCF forwards the PRACK request to S-CSCF.

Table 17.2.2.1-39: PRACK (I-CSCF to S-CSCF)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:scscf2.home1.net, sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

40. PRACK (MO#1b to S-S) – see example in table 17.2.2.1-40

S-CSCF forwards the PRACK request to the terminating endpoint, as per the S-CSCF to S-CSCF procedure.

Table 17.2.2.1-40: PRACK (MO#1b to S-S)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

41. 200 OK (S-S to MO#1b) – see example in table 17.2.2.1-41 (related to 17.2.2.1-40)

The destination endpoint responds to the PRACK request (40) with a 200 OK response.

Table 17.2.2.1-41: 200 OK (S-S to MO#1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

42. 200 OK (S-CSCF to I-CSCF) – see example in table 17.2.2.1-42

S-CSCF forwards the 200 OK response to I-CSCF.

Table 17.2.2.1-42: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

43. 200 OK (I-CSCF to P-CSCF) – see example in table 17.2.2.1-43

I-CSCF forwards the 200 OK response to P-CSCF.

Table 17.2.2.1-43: 200 OK (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Record-Route: Entries to the left of I-CSCF's entry are reversed and translated.

44. 200 OK (P-CSCF to UE) – see example in table 17.2.2.1-44

P-CSCF forwards the 200 OK response to UE.

Table 17.2.2.1-44: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

45. 200 OK (S-S to MO#1b) – see example in table 17.2.2.1-45 (related to 17.2.2.1-8)

When the called party answers, the terminating endpoint sends a 200 OK final response to the INVITE request (8), as specified by the termination procedures and the S-CSCF to S-CSCF procedures, to S-CSCF.

Table 17.2.2.1-45: 200 OK (S-S to MO#1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:succes sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

Upon receiving the 200 OK, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 17.2.2.1-45b.

Table 17.2.2.1-45b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159sip:B36(SHA-
1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest):
sip:scscf2.home1.net,sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home1.net
Route(2orig): sip:icscf1_p.home1.net,
sip:%5b5555%3a%3aaaa%3abbb%3acc%3add%5d@pcscf1.visited1.net

```

46. Service Control

S-CSCF performs whatever service control is appropriate for the completed session.

47. 200 OK (S-CSCF to I-CSCF) – see example in table 17.2.2.1-47

S-CSCF sends a 200 OK final response along the signalling path back to I-CSCF.

Table 17.2.2.1-47: 200 OK (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

48. 200 OK (I-CSCF to P-CSCF) – see example in table 17.2.2.1-48

I-CSCF sends the 200 OK final response to P-CSCF.

Table 17.2.2.1-48: 200 OK (I-CSCF to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:pcscf2.home1.net, sip:Token(scscf2.home1.net, scscf1.home1.net),
    sip:351g45.1@icscf1_p.home1.net, sip:240f34.1@pcscf1.visited1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Record-Route: Entries to the left of I-CSCF's entry are reversed and translated.

49. Approval of QoS Commit

The P-CSCF approves the commitment of the QoS resources.

50. 200 OK (P-CSCF to UE) – see example in table 17.2.2.1-50

P-CSCF indicates the resources reserved for this session should now be committed, and forwards the 200 OK final response to the session originator. UE can start the media flow(s) for this session.

Table 17.2.2.1-50: 200 OK (P-CSCF to UE)


```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

P-CSCF removes the Record-Route, calculates the proper Route header to add to future requests, and saves that information without passing it to UE.

51. ACK (UE to P-CSCF) – see example in table 17.2.2.1-51

UE starts the media flow for this session, and responds to the 200 OK (50) with an ACK request sent to P-CSCF.

Table 17.2.2.1-51: ACK (UE to P-CSCF)

```

ACK sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>; tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>; tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

Cseq: Is required to be the same value as Cseq contained in original INVITE request [3].

52. ACK (P-CSCF to I-CSCF) – see example in table 17.2.2.1-52

P-CSCF forwards the ACK request to I-CSCF.

Table 17.2.2.1-52: ACK (P-CSCF to I-CSCF)

```

ACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf1.home1.net, scscf2.home1.net), sip:pcscf2.home1.net,
      sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Request-URI: The first component of the saved Route header.

Route: Saved from the 200 OK response (with first element moved to Request-URI) with the initial Request-URI (received from the UE) appended as the final component.

53. ACK (I-CSCF to S-CSCF) – see example in table 17.2.2.1-53

I-CSCF determines the routing information, and forwards the ACK request to S-CSCF.

Table 17.2.2.1-53: ACK (I-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:scscf2.home1.net, sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

54. ACK (MO#1b to S-S) – see example in table 17.2.2.1-54

S-CSCF forwards the ACK request to the terminating endpoint, per the S-CSCF to S-CSCF procedure.

Table 17.2.2.1-54: ACK (MO#1b to S-S)

```
ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.home1.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:
```

17.2.2.2 Failure in termination procedure

The roaming subscriber that initiated a session with procedure MO#1b had the attempt fail due to an error detected in the Termination procedure or in the S-CSCF-to-S-CSCF procedure. This could be due to, for example, destination busy (error code 486), destination service denied (error code 403), destination currently out of coverage (error code 480), or some other error.

Depending on the exact error that causes the session initiation failure, and when the error situation was detected, UE#1 could be at many different stages in the session establishment procedure. This is shown in figure 17.2.2.2-1, as optional messages 7-43 that may appear in this error procedure.

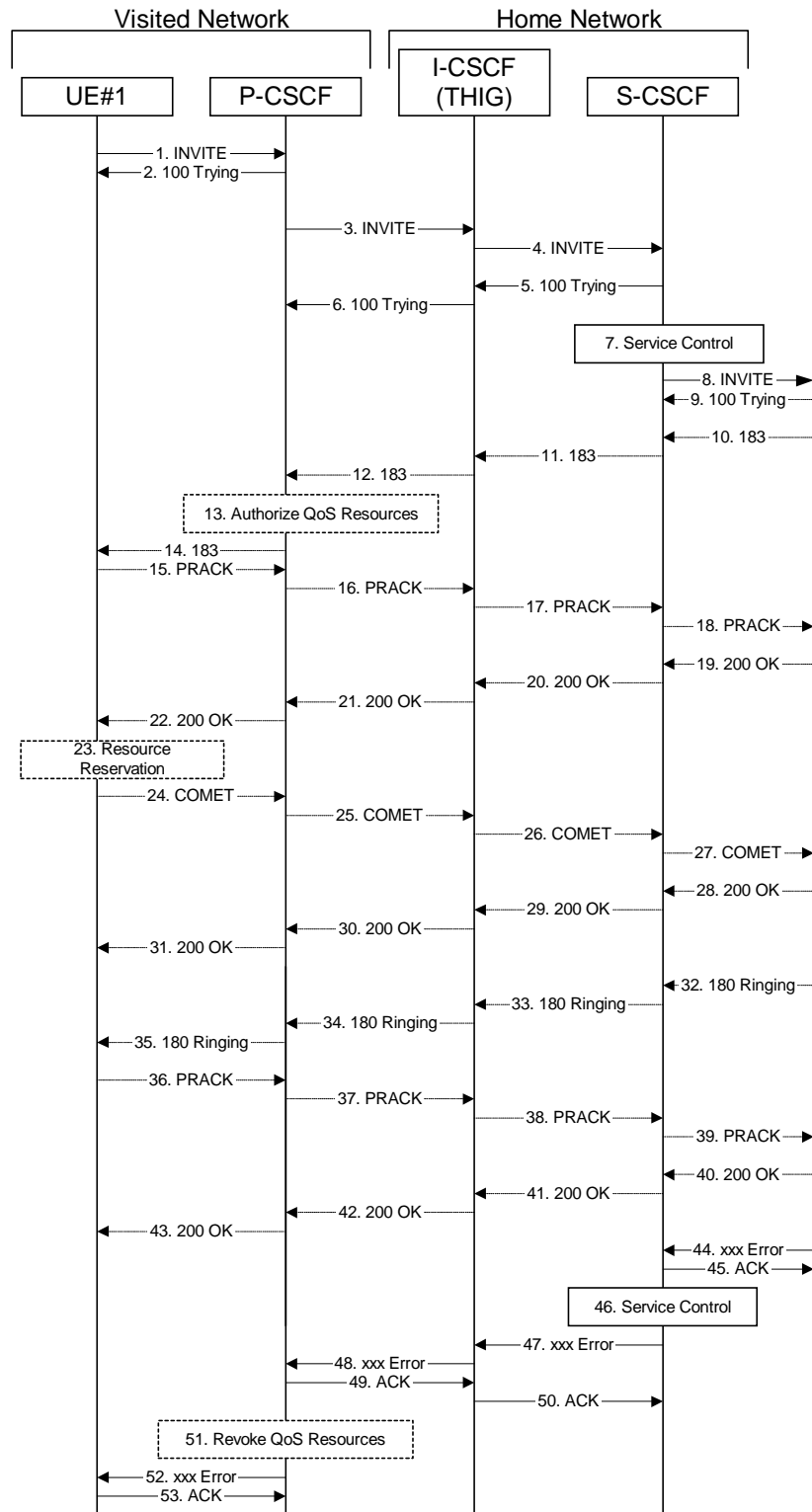


Figure 17.2.2.2-1: Failure in termination procedure

1-8. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 117.2.2.1.

9-43. 100 Trying (S-S to MO#1b) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 117.2.2.1.

44. xxx Error (S-S to MO#1b) – see example in table 17.2.2.2-44 (related to 17.2.2.2-8)

The termination procedure detected some error situation, and returned a SIP error response.

NOTE 1: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 17.2.2.2-44: 486 Busy Here (S-S to MO#1b)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
    tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Retry-After:3600
Content-Length: 0
```

45. ACK (MO#1a to S-S) – see example in table 17.2.2.2-45

Upon receive the 486 response from the S-S procedure, S-CSCF sends ACK.

Table 17.2.2.2-45: ACK (MO#1a to S-S)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

46. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

47. xxx Error (S-CSCF to P-CSCF) – see example in table 17.2.2.2-47 (related to 17.2.2.2-44)

The S-CSCF returned a SIP error response to I-CSCF.

NOTE 2: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 17.2.2.2-47: 486 Busy Here (S-CSCF to I-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

48. xxx Error (I-CSCF to P-CSCF) – see example in table 17.2.2.2-48

The I-CSCF returned a SIP error response to P-CSCF.

NOTE 3: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 17.2.2.2-48: 486 Busy Here (S-CSCF to I-CSCF)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

49. ACK (P-CSCF to I-CSCF) – see example in table 17.2.2.2-49

Upon receive the 486 response from the I-CSCF, P-CSCF sends ACK.

Table 17.2.2.2-49: ACK (P-CSCF to I-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

50. ACK (I-CSCF to S-CSCF) – see example in table 17.2.2.2-50

Upon receive the 486 response from the P-CSCF, I-CSCF sends ACK.

Table 17.2.2.2-50: ACK (I-CSCF to S-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

51. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

52. xxx Error (P-CSCF to UE) – see example in table 17.2.2.2-52 (related to 17.2.2.2-48)

The P-CSCF returned a SIP error response to UE.

NOTE 4: The error response may be, for example, "486 Busy", "403 Service Denied", "480 Temporarily Unavailable", or others. For this example, "486 Busy" is shown.

Table 17.2.2.2-52: 486 Busy Here (P-CSCF to UE)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Retry-After:3600
Content-Length: 0
```

53. ACK (UE to P-CSCF) – see example in table 17.2.2.2-53

Upon receive the 486 response from the P-CSCF, UE sends ACK.

Table 17.2.2.2-53: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

17.2.2.3 Session abandoned, or resource failure

The roaming subscriber that initiated a session with procedure MO#1b either abandoned the attempt, or was unable to obtain the resources necessary for the session. The signalling flow for this error handling is shown in figure 17.2.2.3-1.

If the session is aborted due to failure to obtain resources, it will occur at step #23 in the signalling flow; steps 24-43 (marked as optional) will not be present. If the session is abandoned due to user command, it can happen at any point between steps 10-43.

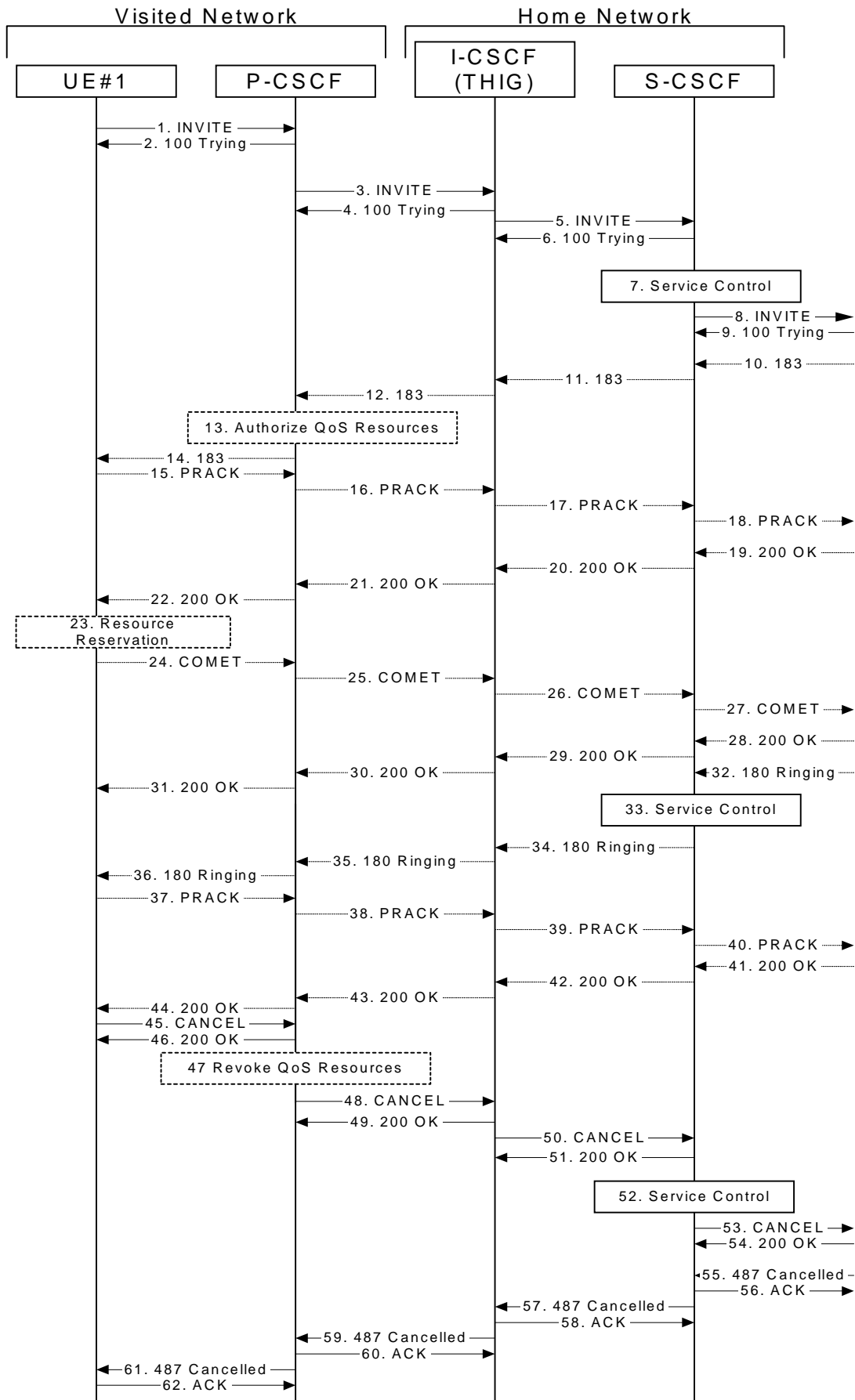


Figure 17.2.2.3-1: Session abandoned or resource failure

1-9. INVITE (UE to P-CSCF) et seq

UE#1 initiated a session, as described in subclause 17.2.2.1.

10-44. 183 SDP (S-S to MO#1b) et seq

Session initiation possibly continued, prior to detection of a failure condition, as described in subclause 17.2.2.1.

45. CANCEL (UE to P-CSCF) – see example in table 17.2.2.3-45

The UE cancelled the original INVITE request.

Table 17.2.2.3-45: CANCEL (UE to P-CSCF)

```
CANCEL sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 CANCEL
Content-Length: 0
```

46. 200 OK (P-CSCF to UE) – see example in table 17.2.2.3-46

Upon receive the CANCEL request from the UE, P-CSCF sends 200 OK.

Table 17.2.2.3-46: 200 OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

47. Revoke QoS authorization

P-CSCF removes the QoS authorization, if any, for this session.

48. CANCEL (P-CSCF to I-CSCF) – see example in table 17.2.2.3-48 (related to table 17.2.2.3-45)

The P-CSCF forwards the CANCEL request to I-CSCF.

Table 17.2.2.3-48: CANCEL (P-CSCF to I-CSCF)

```
CANCEL sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Editor's Note: Need to check whether P-CSCF should modify the Contact: header in the CANCEL.

49. 200 OK (I-CSCF to P-CSCF) – see example in table 17.2.2.3-49

Upon receiving the 200-OK response from the P-CSCF, I-CSCF sends 200 OK.

Table 17.2.2.3-49: 200 OK (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

50. CANCEL (I-CSCF to S-CSCF) – see example in table 17.2.2.3-50

The I-CSCF forwards the CANCEL request to S-CSCF.

Table 17.2.2.3-50: CANCEL (I-CSCF to S-CSCF)

```
CANCEL sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Editor's Note: Need to check whether P-CSCF should modify the Contact: header in the CANCEL.

51. 200 OK (S-CSCF to I-CSCF) – see example in table 17.2.2.3-51

Upon receiving the CANCEL request from the P-CSCF, S-CSCF sends 200 OK.

Table 17.2.2.3-51: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

52. Service Control

S-CSCF performs whatever service control is appropriate for this failed session attempt.

53. CANCEL (S-CSCF to S-S) – see example in table 17.2.2.3-53 (related to table 17.2.2.3-50)

The S-CSCF forwards the CANCEL request to the appropriate S-CSCF-to-S-CSCF procedure.

Table 17.2.2.3-53: CANCEL (S-CSCF to S-S)

```
CANCEL sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

Editor's Note: Need to check whether a proxy inserts a Record-Route in a CANCEL request.

54. 200 OK (S-S to S-CSCF) – see example in table 17.2.2.3-54

Upon receive the CANCEL request from the S-CSCF, the next hop (whatever it is) sends 200 OK.

Table 17.2.2.3-54: 200 OK (S-S to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

55. 487 Cancelled (S-S to MO#1b) – see example in table 17.2.2.3-55 (related to table 17.2.2.3-8)

The termination procedure cancelled the request, and returned a SIP error response to the original INVITE request.

Table 17.2.2.3-55: 487 Cancelled (S-S to MO#1b)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact: sip:[5555::eee:fff:aaa:bbb]
Call-ID:
CSeq: 127 INVITE
Content-Length: 0
```

56. ACK (MO#1b to S-S) – see example in table 17.2.2.3-56

Upon receive the 487 response from the S-S procedure, S-CSCF sends ACK.

Table 17.2.2.3-56: ACK (MO#1b to S-S)

```
ACK sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

57. 487 Cancelled (S-CSCF to I-CSCF) – see example in table 17.2.2.3-57 (related to table 17.2.2.3-53)

The S-CSCF returned the SIP error response to I-CSCF.

Table 17.2.2.3-57: 487 Cancelled (S-CSCF to I-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Content-Length: 0
```

58. ACK (I-CSCF to S-CSCF) – see example in table 17.2.2.3-58

Upon receive the ACK from the P-CSCF, I-CSCF sends ACK.

Table 17.2.2.3-58: ACK (I-CSCF to S-CSCF)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

59. 487 Cancelled (I-CSCF to P-CSCF) – see example in table 17.2.2.3-59

The I-CSCF returned the SIP error response to P-CSCF.

Table 17.2.2.3-59: 487 Cancelled (I-CSCF to P-CSCF)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Content-Length: 0
```

60. ACK (P-CSCF to I-CSCF) – see example in table 17.2.2.3-60

Upon receive the 487 response from the S-CSCF, P-CSCF sends ACK.

Table 17.2.2.3-59: ACK (P-CSCF to I-CSCF)

```
ACK sip:icscf1_p.home1.net SIP/2.0Via: SIP/2.0/UDP pcscf1.visited1.net
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

61. 487 Cancelled (P-CSCF to UE) – see example in table 17.2.2.3-61 (related to table 17.2.2.3-56)

The P-CSCF returned a SIP error response to UE.

Table 17.2.2.3-61: 487 Cancelled (P-CSCF to UE)

```
SIP/2.0 487 Cancelled
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Contact:
Call-ID:
CSeq:
Content-Length: 0
```

62. ACK (UE to P-CSCF) – see example in table 17.2.2.3-62

Upon receive the 487 response from the P-CSCF, UE sends ACK.

Table 17.2.2.3-62: ACK (UE to P-CSCF)

```
ACK sip:+1-212-555-2222@home1.net;user=phone SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq: 127 ACK
Content-Length: 0
```

17.3 S-CSCF (MGCF) to S-CSCF (MGCF) procedures

17.3.1 Introduction

See subclause 7.3.1.

17.3.2 S-S#1b

17.3.2.1 (S-S#1b) Different network operators performing origination and termination, with configuration hiding by both network operators (MO#2, MT#2 assumed)

Figure 17.3.2.1-1 shows a S-CSCF handling session origination (S-CSCF#1) which performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. The originating network operator desires to keep their configuration hidden, so forwards the request through an I-CSCF (I-CSCF#1) to a well-known entry point in the destination operator's network, I-CSCF#2. I-CSCF#2 queries the HSS for current location information, and finds the S-CSCF assigned to the subscriber (S-CSCF#2), and forwards the request to S-CSCF#2. The terminating network operator also desires to keep their configuration hidden, so I-CSCF#2 inserts itself into the signalling path for future exchanges.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#1b is therefore a visited network.
- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#1b is therefore a visited network.
- MO#2** Mobile origination, located in home service area. The "Originating Network" of S-S#1b is therefore the home network.
- CS-O** CS Networks origination. The "Originating Network" of S-S#1b is the home network. The element labelled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- MT#1a** Mobile termination, roaming, without a THIG. The "Terminating Network" of S-S#1b is a visited network.
- MT#1b** Mobile termination, roaming, with a THIG in home network. The "Terminating Network" of S-S#1b is a visited network.
- MT#2** Mobile termination, located in home service area. The "Terminating Network" of S-S#1b is the home network.

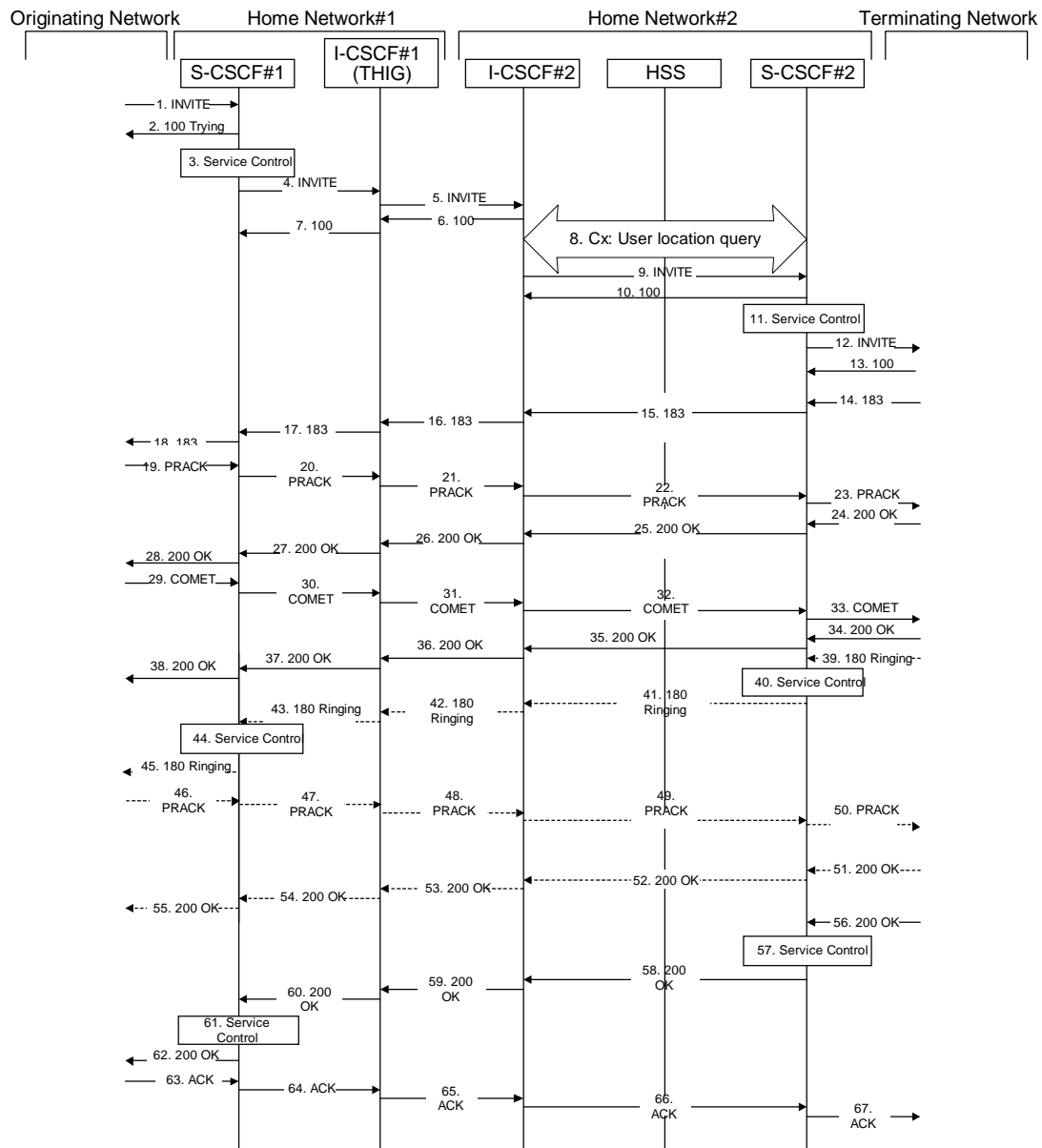


Figure 17.3.2.1-1: S-S#1b

Procedure S-S#1b is as follows:

1. INVITE (MO to S-S#1b) – see example in table 17.3.2.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 17.3.2.1-1: INVITE (MO to S-S#1b)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1b to MO) – see example in table 17.3.2.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.3.2.1-2: 100 Trying (S-S#1b to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 17.3.2.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator desires to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request to I-CSCF#1.

Table 17.3.2.1-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
 [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Request-URI: Set to the I-CSCF that will perform the translation needed to maintain configuration independence.

Route: Updated to cause I-CSCF to forward the request to the proper terminating network operator. In the case of a TEL-URL, it has to be translated to a globally routable SIP-URL before sending the INVITE request. For this address translation the S-CSCF may use the services of an ENUM-DNS based database structure, or any other suitable translation database.

Editor's Note: It remains to be clarified if the use of the word "may" in the above sentence, needs to be changed to "shall". 23.228v170 states that an S-CSCF shall support an ENUM DNS translation mechanism, so the above text needs to be aligned with Stage 2.

5. INVITE (I-CSCF to I-CSCF) – see example in table 17.3.2.1-5

I-CSCF#1 forwards the INVITE request to I-CSCF#2.

Table 17.3.2.1-5: INVITE (I-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net)
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

Via/Record-Route: Translated to maintain configuration independence of the home#1 operator.

6. 100 Trying (I-CSCF to I-CSCF) – see example in table 17.3.2.1-6

I-CSCF#2 respond to the INVITE request (5) with a 100 Trying provisional response.

Table 17.3.2.1-6: 100 Trying (I-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 17.3.2.1-7

I-CSCF#1 determines the Via header, and forwards the 100 Trying provisional response to S-CSCF#1.

Table 17.3.2.1-7: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```


8. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 5) which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to the SIP INVITE request (flow 9) and sent to the S-CSCF.

9. INVITE (I-CSCF to S-CSCF) – see example in table 17.3.2.1-9

I-CSCF#2 forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 17.3.2.1-9: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net,
    sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=

```

10. 100 Trying (S-CSCF to I-CSCF) – see example in table 17.3.2.1-10

S-CSCF#2 responds to the INVITE request (10) with a 100 Trying provisional response.

Table 17.3.2.1-10: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

12. INVITE (S-S#1b to MT) – see example in table 17.3.2.1-12

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 17.3.2.1-12: INVITE (S-S#1b to MT)

```
INVITE sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:871y12.1@icscf2_s.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

13. 100 Trying (MT to S-S#1b) – see example in table 17.3.2.1-13

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request (13), as specified by the termination procedures.

Table 17.3.2.1-13: 100 Trying (MT to S-S#1b)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

14. 183 Session Progress (MT to S-S#1b) – see example in table 17.3.2.1-14

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response to the INVITE request (13), as per the termination procedure.

Editor's Note: Diagram for S-S#1 should show I-CSCF#2 as a THIG and gateway, making it consistent with I-CSCF#1.

Table 17.3.2.1-14: 183 Session Progress (MT to S-S#1b)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

15. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 17.3.2.1-15

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF#2.

Table 17.3.2.1-15: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

16. 183 Session Progress (I-CSCF to I-CSCF) – see example in table 17.3.2.1-16

I-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF#1.

Table 17.3.2.1-16: 183 Session Progress (I-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

17. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 17.3.2.1-17

I-CSCF#1 forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 17.3.2.1-17: 183 Session Progress (I-CSCF to S-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Record-Route: I-CSCF#1 determines the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

18. 183 Session Progress (S-S#1b to MO) – see example in table 17.3.2.1-18

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 17.3.2.1-18: 183 Session Progress (S-S#1b to MO)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
```

```
a=
a=
a=
m=
```

19. PRACK (MO to S-S#1b) – see example in table 17.3.2.1-19

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 17.3.2.1-19: PRACK (MO to S-S#1b)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net,
pcscf2.home2.net) sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:431h23.1@pcscf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

20. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-20

S-CSCF#1 forwards the PRACK request to I-CSCF#1.

Table 17.3.2.1-20: PRACK (S-CSCF to I-CSCF)

```
PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net),
sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
```

```
a=
m=
```

21. PRACK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-21

I-CSCF#1 forwards the PRACK request to I-CSCF#2.

Table 17.3.2.1-21: PRACK (I-CSCF to I-CSCF)

```
PRACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
  pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net), sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
  sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Via/Route/Record-Route: Translated to maintain configuration independence of the home#1 operator.

22. PRACK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-22

I-CSCF#2 determines the routing information, and forwards the PRACK request to S-CSCF#2.

Table 17.3.2.1-22: PRACK (I-CSCF to S-CSCF)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
  SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
  [5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net,
  sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
```

```
a=
m=
```

23. PRACK (S-S#1b to MT) – see example in table 17.3.2.1-23

S-CSCF#2 forwards the PRACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.2.1-23: PRACK (S-S#1b to MT)

```
PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:871y12.1@icscf2_s.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

24. 200 OK (MT to S-S#1b) – see example in table 17.3.2.1-24

The terminating endpoint responds to the PRACK request (24) with a 200 OK response.

Table 17.3.2.1-24: 200 OK (MT to S-S#1b)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Length: 0
```

25. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-25

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.2.1-25: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
```



```
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

26. 200 OK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-26

I-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.2.1-26: 200 OK (I-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

27. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-27

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.2.1-27: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

28. 200 OK (S-S#1b to MO) – see example in table 17.3.2.1-28

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.2.1-28: 200 OK (S-S#1b to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

29. COMET (MO to S-S#1b) – see example in table 17.3.2.1-29

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 17.3.2.1-29: COMET (MO to S-S#1b)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
      sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:431h23.1@pcscf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

30. COMET (S-CSCF to I-CSCF) – see example in table 17.3.2.1-30

S-CSCF#1 forwards the COMET request to I-CSCF#1.

Table 17.3.2.1-30: COMET (S-CSCF to I-CSCF)

```

COMET sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net),
      sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

31. COMET (I-CSCF to I-CSCF) – see example in table 17.3.2.1-31

I-CSCF#1 forwards the COMET request to I-CSCF#2.

Table 17.3.2.1-31: COMET (I-CSCF to I-CSCF)

```

COMET sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net), sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via/Route/Record-Route: Translated to maintain configuration independence of the home#1 operator.

32. COMET (I-CSCF to S-CSCF) – see example in table 17.3.2.1-32

I-CSCF#2 forwards the COMET request to S-CSCF#2.

Table 17.3.2.1-32: COMET (I-CSCF to S-CSCF)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net,
    sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

33. COMET (S-S#1b to MT) – see example in table 17.3.2.1-33

S-CSCF#2 forwards the COMET request to the terminating endpoint, as per the termination procedure.

Table 17.3.2.1-33: COMET (S-S#1b to MT)

```

COMET sip:pcscf2.home2.net SIP/2.0

```

```

Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:871y12.1@icscf2_s.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

34. 200 OK (MT to S-S#1b) – see example in table 17.3.2.1-34

The terminating endpoint responds to the COMET request (34) with a 200 OK response.

Table 17.3.2.1-34: 200 OK (MT to S-S#1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Length: 0

```

35. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-35

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.2.1-35: 200 OK (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:

```

36. 200 OK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-36

I-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.2.1-36: 200 OK (I-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

37. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-37

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.2.1-37: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

38. 200 OK (S-S#1b to MO) – see example in table 17.3.2.1-38

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.2.1-38: 200 OK (S-S#1b to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

39. 180 Ringing (MT to S-S#1b) – see example in table 17.3.2.1-39

The terminating endpoint may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to S-CSCF#2.

Table 17.3.2.1-39: 180 Ringing (MT to S-S#1b)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net)
Require: 100rel
```

```

From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0

```

40. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

41. 180 Ringing (S-CSCF to I-CSCF) – see example in table 17.3.2.1-41

S-CSCF#2 forwards the 180 Ringing response to I-CSCF#2.

Table 17.3.2.1-41: 180 Ringing (S-CSCF to I-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

42. 180 Ringing (I-CSCF to I-CSCF) – see example in table 17.3.2.1-42

I-CSCF#2 forwards the 180 Ringing response to I-CSCF#1.

Table 17.3.2.1-42: 180 Ringing (I-CSCF to I-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

43. 180 Ringing (I-CSCF to S-CSCF) – see example in table 17.3.2.1-43

I-CSCF#1 forwards the 180 Ringing response to S-CSCF#1.

Table 17.3.2.1-43: 180 Ringing (I-CSCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Require:
From:

```

```
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

44. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

45. 180 Ringing (S-S#1b to MO) – see example in table 17.3.2.1-45

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 17.3.2.1-45: 180 Ringing (S-S#1b to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

46. PRACK (MO to S-S#1b) – see example in table 17.3.2.1-46

The originator acknowledges the 180 Ringing provisional response (46) with a PRACK request.

Table 17.3.2.1-46: PRACK (MO to S-S#1b)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net,
pcscf2.home2.net) sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:431h23.1@pcscf1.home1.net
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfgk490333
Cseq: 130 PRACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Rack: 9022 127 INVITE
Content-Length: 0
```

47. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-47

S-CSCF#1 forwards the PRACK request to I-CSCF#1.

Table 17.3.2.1-47: PRACK (S-CSCF to I-CSCF)

```
PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net),
sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
```

```
Contact:
Rack:
Content-Length:
```

48. PRACK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-48

I-CSCF#1 forwards the PRACK request to I-CSCF#2.

Table 17.3.2.1-48: PRACK (I-CSCF to I-CSCF)

```
PRACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net), sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

Via:/Route:/Record-Route: Translated to maintain configuration independence of the home#1 operator.

49. PRACK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-49

I-CSCF#2 determines the routing information, and forwards the PRACK request to S-CSCF#2.

Table 17.3.2.1-49: PRACK (I-CSCF to S-CSCF)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net,
sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

50. PRACK (S-S#1b to MT) – see example in table 17.3.2.1-50

S-CSCF#2 forwards the PRACK request to the terminating endpoint.

Table 17.3.2.1-50: PRACK (S-S#1b to MT)

```
PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:871y12.1@icscf2_s.home2.net,
sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```


51. 200 OK (MT to S-S#1b) – see example in table 17.3.2.1-51

The terminating endpoint responds to the PRACK request (51) with a 200 OK response.

Table 17.3.2.1-51: 200 OK (MT to S-S#1b)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Length: 0
```

52. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-52

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.2.1-52: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

53. 200 OK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-53

I-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.2.1-53: 200 OK (I-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

54. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-54

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.2.1-54: 200 OK (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:

```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

55. 200 OK (S-S#1b to MO) – see example in table 17.3.2.1-55

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.2.1-55: 200 OK (S-S#1b to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:

```

56. 200 OK (MT to S-S#1b) – see example in table 17.3.2.1-56

The final response to the INVITE (13), 200 OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session attempt. The response is sent to S-CSCF#2 per the termination procedure.

Table 17.3.2.1-56: 200 OK (MT to S-S#1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

57. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session completion.

58. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-58

The 200 OK response is forwarded to the I-CSCF#2.

Table 17.3.2.1-58: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

59. 200 OK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-59

The 200 OK response is forwarded to I-CSCF#1.

Table 17.3.2.1-59: 200 OK (I-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Record-Route: Formed by I-CSCF#2 translating all the entries to the left of its own entry.

60. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-60

The 200 OK response is forwarded to S-CSCF#1.

Table 17.3.2.1-60: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(pcscf2.home2.net, sip:764z87.1@scscf2.home2.net),
    sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

61. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session completion.

62. 200 OK (S-S#1b to MO) – see example in table 17.3.2.1-62

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 17.3.2.1-62: 200 OK (S-S#1b to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
```

m=

63. ACK (MO to S-S#1b) – see example in table 17.3.2.1-63

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 17.3.2.1-63: ACK (MO to S-S#1b)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net,
pcscf2.home2.net) sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0
```

64. ACK (S-CSCF to I-CSCF) – see example in table 17.3.2.1-64

S-CSCF#1 forwards the ACK request to I-CSCF#1.

Table 17.3.2.1-64: ACK (S-CSCF to I-CSCF)

```
ACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net),
sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

65. ACK (I-CSCF to I-CSCF) – see example in table 17.3.2.1-65

I-CSCF#1 forwards the ACK request to I-CSCF#2.

Table 17.3.2.1-65: ACK (I-CSCF to I-CSCF)

```
ACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:Token(scscf2.home2.net, sip:876t12.1@pcscf2.home2.net), sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

Via:/Route:/Record-Route: Translated to maintain configuration independence of the home#1 operator.

66. ACK (I-CSCF to S-CSCF) – see example in table 17.3.2.1-66

I-CSCF#2 forwards the ACK request to S-CSCF#2.

Table 17.3.2.1-66: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:871y12.1@icscf2_s.home2.net, sip:312a32.1@icscf1_s.home1.net,
    sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

67. ACK (S-S#1b to MT) – see example in table 17.3.2.1-67

S-CSCF#2 forwards the ACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.2.1-67: ACK (S-S#1b to MT)

```

ACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:764z87.1@scscf2.home2.net, sip:871y12.1@icscf2_s.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

17.3.2.2 Termination failure (not provided)

An example of this flow is not shown in the present document.

17.3.2.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

17.3.3 S-S#1c**17.3.3.1 (S-S#1c) Different network operators performing origination and termination, with configuration hiding by originating network operator (MO#2, MT#2 assumed)**

Figure 17.3.3.1-1 shows a S-CSCF handling session origination (S-CSCF#1) which performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. The originating network operator desires to keep their configuration hidden, so forwards the request through an I-CSCF (I-CSCF#1) to a well-known entry point in the destination operator's network, I-CSCF#2. I-CSCF#2 queries the HSS for current location information, and finds the S-CSCF assigned to the subscriber (S-CSCF#2), and forwards the request to S-CSCF#2. The terminating network operator does not desire to keep their configuration hidden, so I-CSCF#2 does not insert itself into the signalling path for future exchanges.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#1c is therefore a visited network.
- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#1c is therefore a visited network.

MO#2 Mobile origination, located in home service area. The "Originating Network" of S-S#1c is therefore the home network.

CS-O CS Networks origination. The "Originating Network" of S-S#1c is the home network. The element labeled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

MT#1a Mobile termination, roaming, without a THIG. The "Terminating Network" of S-S#1c is a visited network.

MT#1b Mobile termination, roaming, with a THIG in home network. The "Terminating Network" of S-S#1c is a visited network.

MT#2 Mobile termination, located in home service area. The "Terminating Network" of S-S#1c is the home network.

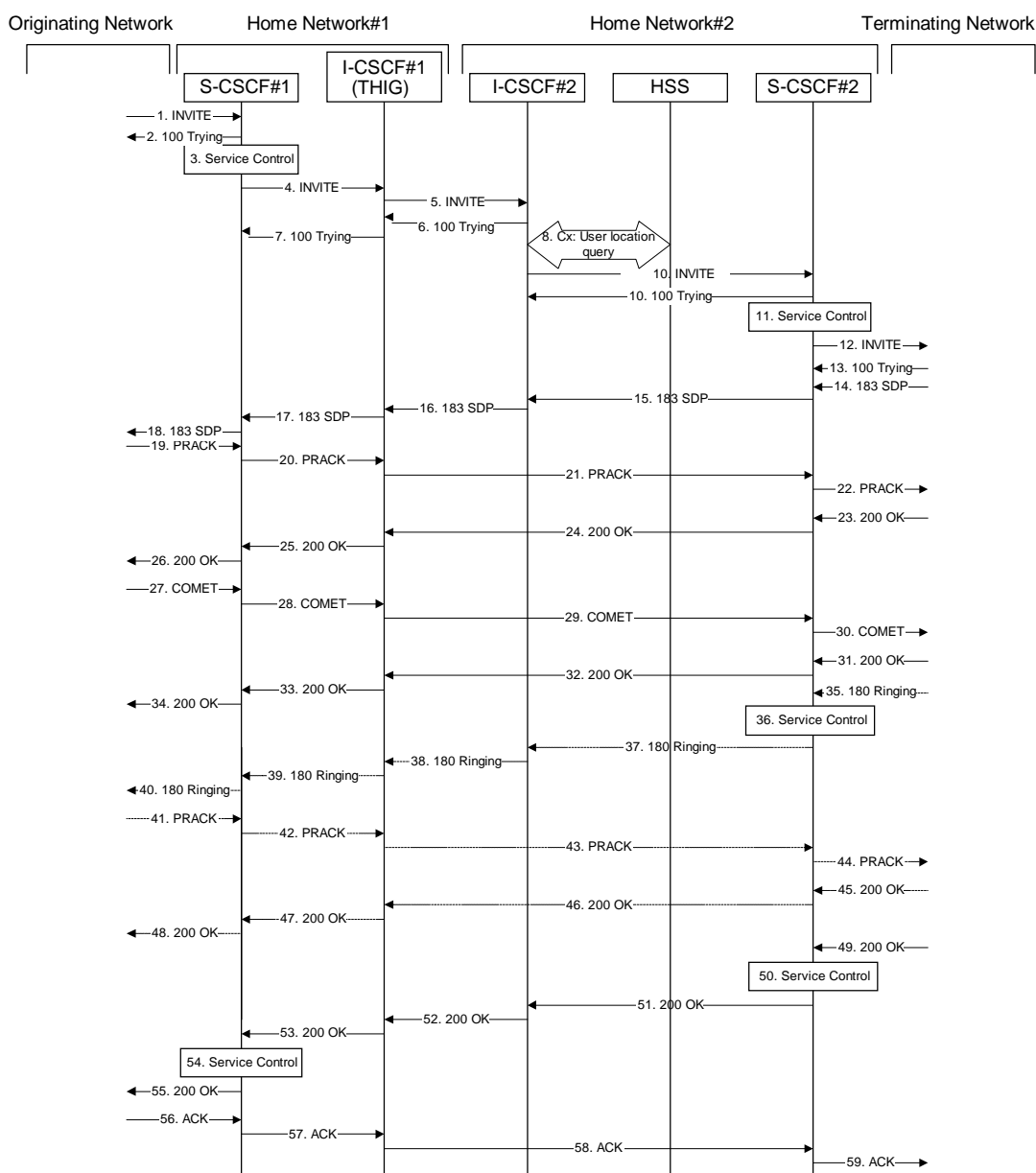


Figure 17.3.3.1-1: S-S#1c

Procedure S-S#1c is as follows:

1. INVITE (MO to S-S#1c) – see example in table 17.3.3.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 17.3.3.1-1: INVITE (MO to S-S#1c)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:431h23.1@pcscf1.home1.net
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1c to MO) – see example in table 17.3.3.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.3.3.1-2: 100 Trying (S-S#1c to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 17.3.3.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. Since the originating operator desires to keep their internal configuration hidden, S-CSCF#1 forwards the INVITE request to I-CSCF#1.

Table 17.3.3.1-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home1.net;user=phone
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Request-URI: Set to the I-CSCF that will perform the translation needed to maintain configuration independence.

Route: Updated to cause I-CSCF to forward the request to the proper terminating network operator. In the case of a TEL-URL, it has to be translated to a globally routable SIP-URL before sending the INVITE request. For this address translation the S-CSCF may use the services of an ENUM-DNS based database structure, or any other suitable translation database.

Editor's Note: It remains to be clarified if the use of the word "may" in the above sentence, needs to be changed to "shall". 23.228v170 states that an S-CSCF shall support an ENUM DNS translation mechanism, so the above text needs to be aligned with Stage 2.

5. INVITE (I-CSCF to I-CSCF) – see example in table 17.3.3.1-5

I-CSCF#1 forwards the INVITE request to I-CSCF#2.

Table 17.3.3.1-5: INVITE (I-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

Via/Record-Route: Translated to maintain configuration independence of the home#1 operator.

6. 100 Trying (I-CSCF to I-CSCF) – see example in table 17.3.3.1-6

I-CSCF#2 respond to the INVITE request (5) with a 100 Trying provisional response.

Table 17.3.3.1-6: 100 Trying (I-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 17.3.3.1-7

I-CSCF#1 determines the Via header, and forwards the 100 Trying provisional response to S-CSCF#1.

Table 17.3.3.1-7: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

8. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE request (flow 5), which are sent to the HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that are mapped to the SIP INVITE request (flow 9) and sent to the S-CSCF.

9. INVITE (I-CSCF to S-CSCF) – see example in table 17.3.3.1-9

I-CSCF#2 forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 17.3.3.1-9: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route:
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=

```

10. 100 Trying (S-CSCF to I-CSCF) – see example in table 17.3.3.1-10

S-CSCF#2 responds to the INVITE request with a 100 Trying provisional response.

Table 17.3.3.1-10: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

12. INVITE (S-S#1c to MT) – see example in table 17.3.3.1-12

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 17.3.3.1-12: INVITE (S-S#1c to MT)

```
INVITE sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:312a32.1@icscf1_s.home1.net,
    sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

13. 100 Trying (MT to S-S#1c) – see example in table 17.3.3.1-13

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request, as specified by the termination procedures.

Table 17.3.3.1-13: 100 Trying (MT to S-S#1c)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

14. 183 Session Progress (MT to S-S#1c) – see example in table 17.3.3.1-14 (related to 17.3.3.1-12)

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response to the INVITE request, as per the termination procedure.

Table 17.3.3.1-14: 183 Session Progress (MT to S-S#1c)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15
```

15. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 17.3.3.1-15

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF#2.

Table 17.3.3.1-15: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

16. 183 Session Progress (I-CSCF to I-CSCF) – see example in table 17.3.3.1-16

I-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF#1.

Table 17.3.3.1-16: 183 Session Progress (I-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

17. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 17.3.3.1-17

I-CSCF#1 forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 17.3.3.1-17: 183 Session Progress (I-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Record-Route: I-CSCF#1 determines the entry to the right of its own entry.

Via: determined by I-CSCF#1.

18. 183 Session Progress (S-S#1c to MO) – see example in table 17.3.3.1-18

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 17.3.3.1-18: 183 Session Progress (S-S#1c to MO)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

19. PRACK (MO to S-S#1c) – see example in table 17.3.3.1-19

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 17.3.3.1-19: PRACK (MO to S-S#1c)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:764z87.1@scscf2.home2.net,
      sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
      tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

20. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-20

S-CSCF#1 forwards the PRACK request to I-CSCF#1.

Table 17.3.3.1-20: PRACK (S-CSCF to I-CSCF)

```

PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

21. PRACK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-21

I-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 17.3.3.1-21: PRACK (I-CSCF to S-CSCF)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route:sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

22. PRACK (S-S#1c to MT) – see example in table 17.3.3.1-22

S-CSCF#2 forwards the PRACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.3.1-22: PRACK (S-S#1c to MT)

```

PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

23. 200 OK (MT to S-S#1c) – see example in table 17.3.3.1-23

The terminating endpoint responds to the PRACK request with a 200 OK response.

Table 17.3.3.1-23: 200 OK (MT to S-S#1c)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

24. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-24

S-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.3.1-24: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length:
```

25. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-25

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.3.1-25: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

26. 200 OK (S-S#1c to MO) – see example in table 17.3.3.1-26

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.3.1-26: 200 OK (S-S#1c to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

27. COMET (MO to S-S#1c) – see example in table 17.3.3.1-27

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 17.3.3.1-27: COMET (MO to S-S#1c)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:764z87.1@scscf2.home2.net,
      sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
      tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

28. COMET (S-CSCF to I-CSCF) – see example in table 17.3.3.1-28

S-CSCF#1 forwards the COMET request to I-CSCF#1.

Table 17.3.3.1-28: COMET (S-CSCF to I-CSCF)

```

COMET sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
m=

```

29. COMET (I-CSCF to S-CSCF) – see example in table 17.3.3.1-29

I-CSCF#1 forwards the COMET request to S-CSCF#2.

Table 17.3.3.1-29: COMET (I-CSCF to S-CSCF)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
      pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route:sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

30. COMET (S-S#1c to MT) – see example in table 17.3.3.1-30

S-CSCF#2 forwards the COMET request to the terminating endpoint, as per the termination procedure.

Table 17.3.3.1-30: COMET (S-S#1c to MT)

```

COMET sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
      Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
      [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

31. 200 OK (MT to S-S#1c) – see example in table 17.3.3.1-31

The terminating endpoint responds to the COMET request with a 200 OK response.

Table 17.3.3.1-31: 200 OK (MT to S-S#1c)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

32. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-32

S-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.3.1-32: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length:
```

33. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-33

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.3.1-33: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Via: Determined by I-CSCF#1.

34. 200 OK (S-S#1c to MO) – see example in table 17.3.3.1-34

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.3.1-34: 200 OK (S-S#1c to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

35. 180 Ringing (MT to S-S#1c) – see example in table 17.3.3.1-35 (related to table 17.3.3.1-12)

The terminating endpoint may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to S-CSCF#2.

Table 17.3.3.1-35: 180 Ringing (MT to S-S#1c)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0

```

36. Session Control**37. 180 Ringing (S-CSCF to I-CSCF) – see example in table 17.3.3.1-37**

S-CSCF#2 forwards the 180 Ringing response to I-CSCF#2.

Table 17.3.3.1-37: 180 Ringing (S-CSCF to I-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

38. 180 Ringing (I-CSCF to I-CSCF) – see example in table 17.3.3.1-38

I-CSCF#2 forwards the 180 Ringing response to I-CSCF#1.

Table 17.3.3.1-38: 180 Ringing (I-CSCF to I-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

39. 180 Ringing (I-CSCF to S-CSCF) – see example in table 17.3.3.1-39

I-CSCF#1 forwards the 180 Ringing response to S-CSCF#1.

Table 17.3.3.1-39: 180 Ringing (I-CSCF to S-CSCF)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

40. 180 Ringing (S-S#1c to MO) – see example in table 17.3.3.1-40

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 17.3.3.1-40: 180 Ringing (S-S#1c to MO)

```

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:

```

41. PRACK (MO to S-S#1c) – see example in table 17.3.3.1-41

The originator acknowledges the 180 Ringing provisional response (40) with a PRACK request.

Table 17.3.3.1-41: PRACK (MO to S-S#1c)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:764z87.1@scscf2.home2.net,
    sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
    tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0

```

42. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-42

S-CSCF#1 forwards the PRACK request to I-CSCF#1.

Table 17.3.3.1-42: PRACK (S-CSCF to I-CSCF)

```

PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

43. PRACK (I-CSCF to I-CSCF) – see example in table 17.3.3.1-43

I-CSCF#1 forwards the PRACK request to S-CSCF#2.

Table 17.3.3.1-43: PRACK (I-CSCF to S-CSCF)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

44. PRACK (S-S#1c to MT) – see example in table 17.3.3.1-44

S-CSCF#2 forwards the PRACK request to the terminating endpoint.

Table 17.3.3.1-44: PRACK (S-S#1c to MT)

```

PRACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

45. 200 OK (MT to S-S#1c) – see example in table 17.3.3.1-45

The terminating endpoint responds to the PRACK request (44) with a 200 OK response.

Table 17.3.3.1-45: 200 OK (MT to S-S#1c)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```


46. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-46

S-CSCF#2 forwards the 200 OK response to I-CSCF#1.

Table 17.3.3.1-46: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length:
```

47. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-47

I-CSCF#1 forwards the 200 OK response to S-CSCF#1.

Table 17.3.3.1-47: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Via: Determined by I-CSCF#1.

48. 200 OK (S-S#1c to MO) – see example in table 17.3.3.1-48

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.3.1-48: 200 OK (S-S#1c to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

49. 200 OK (MT to S-S#1c) – see example in table 17.3.3.1-49 (related to 17.3.3.1-13)

The final response to the INVITE (13), 200 OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session attempt. The response is sent to S-CSCF#2 per the termination procedure.

Table 17.3.3.1-49: 200 OK (MT to S-S#1c)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:Token(scscf1.home1.net, sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

50. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session completion.

51. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-51

The 200 OK response is forwarded to the I-CSCF#2.

Table 17.3.3.1-51: 200 OK (S-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

52. 200 OK (I-CSCF to I-CSCF) – see example in table 17.3.3.1-52

The 200 OK response is forwarded to I-CSCF#1.

Table 17.3.3.1-52: 200 OK (I-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

53. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-53

The 200 OK response is forwarded to S-CSCF#1.

Table 17.3.3.1-53: 200 OK (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:876t12.1@pcscf2.home2.net, sip:764z87.1@scscf2.home2.net,
    sip:312a32.1@icscf1_s.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Record-Route: Formed by I-CSCF#1 determining the entry to the right of its own entry.

Via: Determined by I-CSCF#1.

54. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session completion.

55. 200 OK (S-S#1c to MO) – see example in table 17.3.3.1-55

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 17.3.3.1-55: 200 OK (S-S#1c to MO)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

56. ACK (MO to S-S#1c) – see example in table 17.3.3.1-56

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 17.3.3.1-56: ACK (MO to S-S#1c)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:764z87.1@scscf2.home2.net,
      sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>;
      tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Content-Length: 0

```

57. ACK (S-CSCF to I-CSCF) – see example in table 17.3.3.1-57

S-CSCF#1 forwards the ACK request to I-CSCF#1.

Table 17.3.3.1-57: ACK (S-CSCF to I-CSCF)

```

ACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:764z87.1@scscf2.home2.net, sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

58. ACK (I-CSCF to S-CSCF) – see example in table 17.3.3.1-58

I-CSCF#1 forwards the ACK request to S-CSCF#2.

Table 17.3.3.1-58: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:876t12.1@pcscf2.home2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

59. ACK (S-S#1c to MT) – see example in table 17.3.3.1-59

S-CSCF#2 forwards the ACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.3.1-59: ACK (S-S#1c to MT)

```

ACK sip:pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

17.3.3.2 Termination failure (not provided)

An example of this flow is not shown in the present document.

17.3.3.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

17.3.4 S-S#1d**17.3.4.1 (S-S#1d) Different network operators performing origination and termination, with configuration hiding by terminating network operator (MO#2, MT#2 assumed)**

Figure 17.3.4.1-1 shows a S-CSCF handling session origination (S-CSCF#1) which performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. S-CSCF#1 forwards the request to a well-known entry point in the destination operator's network, I-CSCF#2. I-CSCF#2 queries the HSS for current location information, and finds the S-CSCF assigned to the subscriber (S-CSCF#2), and forwards the request to S-CSCF#2. The terminating network operator desires to keep their configuration hidden, so I-CSCF#2 inserts itself into the signalling path for future exchanges.

Origination sequences that share this common S-CSCF to S-CSCF procedure are:

- MO#1a** Mobile origination, roaming, without a THIG. The "Originating Network" of S-S#1d is therefore a visited network.
- MO#1b** Mobile origination, roaming, with a THIG in home network. The "Originating Network" of S-S#1d is therefore a visited network.
- MO#2** Mobile origination, located in home service area. The "Originating Network" of S-S#1d is therefore the home network.
- CS-O** CS Networks origination. The "Originating Network" of S-S#1d is the home network. The element labeled S-CSCF#1 is the MGCF of the CS-O procedure.

Termination sequences that share this common S-CSCF to S-CSCF procedure are:

- MT#1a** Mobile termination, roaming, without a THIG. The "Terminating Network" of S-S#1d is a visited network.
- MT#1b** Mobile termination, roaming, with a THIG in home network. The "Terminating Network" of S-S#1d is a visited network.
- MT#2** Mobile termination, located in home service area. The "Terminating Network" of S-S#1d is the home network.

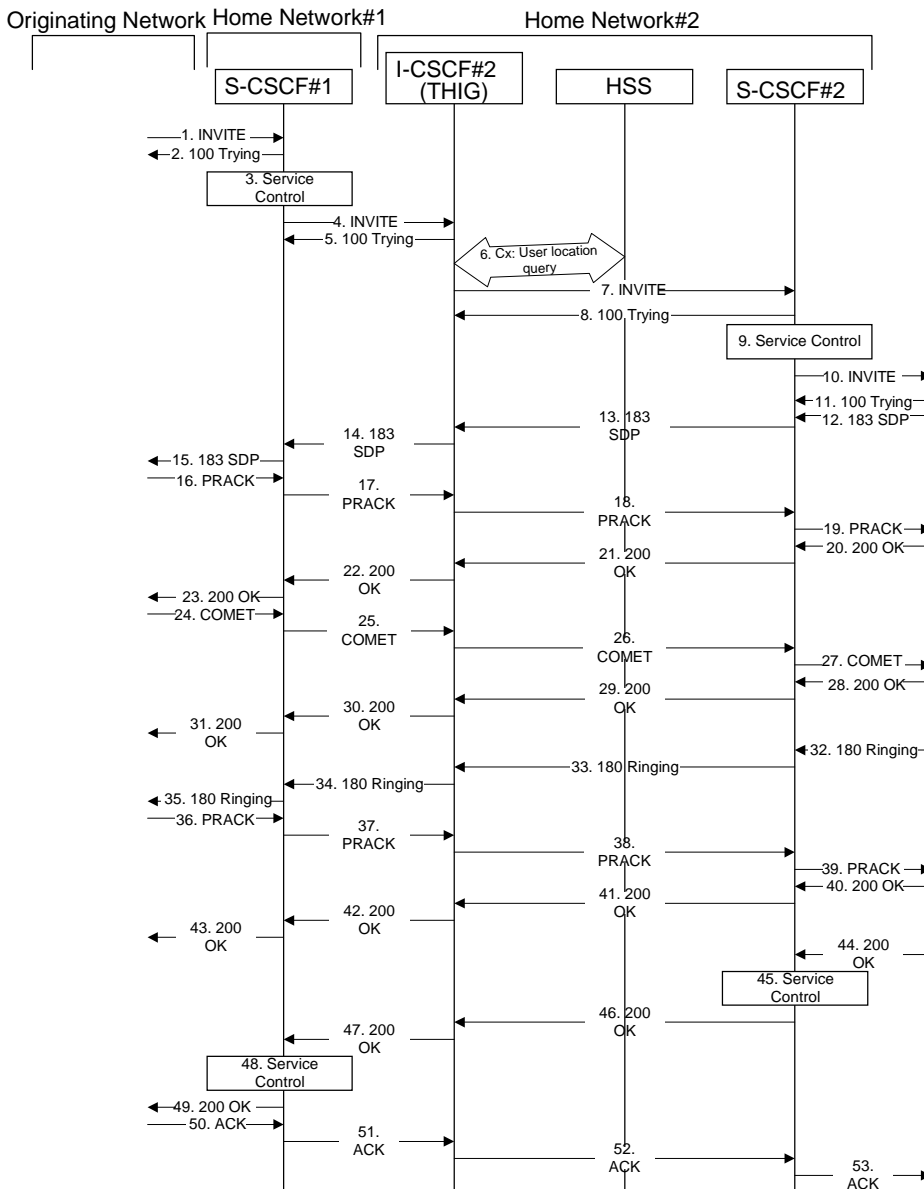


Figure 17.3.4.1-1: S-S#1d

Procedure S-S#1d is as follows:

1. INVITE (MO to S-S#1d) – see example in table 17.3.4.1-1

The INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating signalling flow.

Table 17.3.4.1-1: INVITE (MO to S-S#1d)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
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=907165275 0
m=video 3400 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=qos:mandatory sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

2. 100 Trying (S-S#1d to MO) – see example in table 17.3.4.1-2

S-CSCF#1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.3.4.1-2: 100 Trying (S-S#1d to MO)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#1 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

For this example, assume the subscriber is not allowed video.

4. INVITE (S-CSCF to I-CSCF) – see example in table 17.3.4.1-4

S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. S-CSCF#1 forwards the INVITE request to I-CSCF#2, the well-known entry point of the destination network.

Table 17.3.4.1-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:+1-212-555-2222@home2.net;user=phone SIP/2.0
Via: SIP/2.0/UDP sip:scscf1.home1.net SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000

```

Request-URI: Set to the I-CSCF that will perform the translation needed to maintain configuration independence.

Via/Record-Route: Translated to maintain configuration independence of the home#1 operator.

5. 100 Trying (I-CSCF to I-CSCF) – see example in table 17.3.4.1-5

I-CSCF#2 respond to the INVITE request (4) with a 100 Trying provisional response.

Table 17.3.4.1-5: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6. Cx: User Location Query procedure

The I-CSCF sends a query to the HSS to find out the S-CSCF of the called user. The HSS responds with the address of the current S-CSCF for the terminating subscriber.

For detailed message flows see 3GPP TS 29.228.

Table 7.3.2-6a provides the parameters in the SIP INVITE message (flow 4) which need to be sent to HSS.

Table 7.3.2-6b provides the parameters sent from the HSS that need to be mapped to SIP INVITE (flow 7) and sent to S-CSCF.

7. INVITE (I-CSCF to S-CSCF) – see example in table 17.3.4.1-7

I-CSCF#2 forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

Table 17.3.4.1-7: INVITE (I-CSCF to S-CSCF)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
b=
a=
a=
a=

```

8. 100 Trying (S-CSCF to I-CSCF) – see example in table 17.3.4.1-8

S-CSCF#2 responds to the INVITE request (7) with a 100 Trying provisional response.

Table 17.3.4.1-8: 100 Trying (S-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

9. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session attempt.

S-CSCF#2 examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

10. INVITE (S-S#1d to MT) – see example in table 17.3.4.1-10

S-CSCF#2 forwards the INVITE request, as determined by the termination procedure.

Table 17.3.4.1-10: INVITE (S-S#1d to MT)

```

INVITE sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:+1-212-555-2222@home2.net;user=phone
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15

```

11. 100 Trying (MT to S-S#1d) – see example in table 17.3.4.1-11

S-CSCF#2 receives a 100 Trying provisional response to the INVITE request (10), as specified by the termination procedures.

Table 17.3.4.1-11: 100 Trying (MT to S-S#1d)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

12. 183 Session Progress (MT to S-S#1d) – see example in table 17.3.4.1-12

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response to the INVITE request (10), as per the termination procedure.

Editor's Note: Diagram for S-S#1 should show I-CSCF#2 as a THIG and gateway, making it consistent with I-CSCF#1.

Table 17.3.4.1-12: 183 Session Progress (MT to S-S#1d)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abb%5d@pcscf2.home2.net
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=audio 0 RTP/AVP 97 96 0 15

```

13. 183 Session Progress (S-CSCF to I-CSCF) – see example in table 17.3.4.1-13

S-CSCF#2 forwards the 183 Session Progress provisional response to I-CSCF#2.

Table 17.3.4.1-13: 183 Session Progress (S-CSCF to I-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

14. 183 Session Progress (I-CSCF to S-CSCF) – see example in table 17.3.4.1-14

I-CSCF#2 forwards the 183 Session Progress provisional response to S-CSCF#1.

Table 17.3.4.1-14: 183 Session Progress (I-CSCF to S-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

15. 183 Session Progress (S-S#1d to MO) – see example in table 17.3.4.1-15

S-CSCF#1 forwards the 183 Session Progress to the originator, as per the originating procedure.

Table 17.3.4.1-15: 183 Session Progress (S-S#1d to MO)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

16. PRACK (MO to S-S#1d) – see example in table 17.3.4.1-16

The originator decides the final set of media streams, and includes this information in the PRACK request sent to S-CSCF#1 by the origination procedures.

Table 17.3.4.1-16: PRACK (MO to S-S#1d)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:icscf.home2.net, sip:Token(scscf2.home2.net),
      sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

17. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-17

S-CSCF#1 forwards the PRACK request to I-CSCF#2.

Table 17.3.4.1-17: PRACK (S-CSCF to I-CSCF)

```

PRACK sip:icscf.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

18. PRACK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-18

I-CSCF#2 determines the routing information, and forwards the PRACK request to S-CSCF#2.

Table 17.3.4.1-18: PRACK (I-CSCF to S-CSCF)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

19. PRACK (S-S#1d to MT) – see example in table 17.3.4.1-19

S-CSCF#2 forwards the PRACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.4.1-19: PRACK (S-S#1d to MT)

```

PRACK sip:%5b5555%3a%3aeeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

20. 200 OK (MT to S-S#1d) – see example in table 17.3.4.1-20

The terminating endpoint responds to the PRACK request (19) with a 200 OK response.

Table 17.3.4.1-20: 200 OK (MT to S-S#1d)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Content-Length: 0
```

21. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-21

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.4.1-21: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

22. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-22

I-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 17.3.4.1-22: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

23. 200 OK (S-S#1d to MO) – see example in table 17.3.4.1-23

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.4.1-23: 200 OK (S-S#1d to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

24. COMET (MO to S-S#1d) – see example in table 17.3.4.1-24

When the originating endpoint has completed the resource reservation procedures, it sends the COMET request to S-CSCF#1 by the origination procedures.

Table 17.3.4.1-24: COMET (MO to S-S#1d)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:icscf.home2.net, sip:Token(scscf2.home2.net),
      sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:succes sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

25. COMET (S-CSCF to I-CSCF) – see example in table 17.3.4.1-25

S-CSCF#1 forwards the COMET request to I-CSCF#2.

Table 17.3.4.1-25: COMET (S-CSCF to I-CSCF)

```

COMET sip:icscf.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

26. COMET (I-CSCF to S-CSCF) – see example in table 17.3.4.1-26

I-CSCF#2 forwards the COMET request to S-CSCF#2.

Table 17.3.4.1-26: COMET (I-CSCF to S-CSCF)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

27. COMET (S-S#1d to MT) – see example in table 17.3.4.1-27

S-CSCF#2 forwards the COMET request to the terminating endpoint, as per the termination procedure.

Table 17.3.4.1-27: COMET (S-S#1d to MT)

```

COMET sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

28. 200 OK (MT to S-S#1d) – see example in table 17.3.4.1-28

The terminating endpoint responds to the COMET request (27) with a 200 OK response.

Table 17.3.4.1-28: 200 OK (MT to S-S#1d)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net
Content-Length: 0
```

29. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-29

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.4.1-29: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

30. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-30

I-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 17.3.4.1-30: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

31. 200 OK (S-S#1d to MO) – see example in table 17.3.4.1-31

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.4.1-31: 200 OK (S-S#1d to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

32. 180 Ringing (MT to S-S#1d) – see example in table 17.3.4.1-32

The terminating endpoint may optionally send a 180 Ringing provisional response indicating alerting is in progress. This response is sent by the termination procedure to S-CSCF#2.

Table 17.3.4.1-32: 180 Ringing (MT to S-S#1d)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Require: 100rel
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3ae%3aff%3aaa%3abb%5d@pcscf2.home2.net
RSeq: 9022
Content-Length: 0
```

33. 180 Ringing (S-CSCF to I-CSCF) – see example in table 17.3.4.1-33

S-CSCF#2 forwards the 180 Ringing response to I-CSCF#2.

Table 17.3.4.1-33: 180 Ringing (S-CSCF to I-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

34. 180 Ringing (I-CSCF to S-CSCF) – see example in table 17.3.4.1-34

I-CSCF#2 forwards the 180 Ringing response to S-CSCF#1.

Table 17.3.4.1-34: 180 Ringing (I-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

35. 180 Ringing (S-S#1d to MO) – see example in table 17.3.4.1-35

S-CSCF#1 forwards the 180 Ringing response to the originator, per the origination procedure.

Table 17.3.4.1-35: 180 Ringing (S-S#1d to MO)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

36. PRACK (MO to S-S#1d) – see example in table 17.3.4.1-36

The originator acknowledges the 180 Ringing provisional response (35) with a PRACK request.

Table 17.3.4.1-36: PRACK (MO to S-S#1d)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:icscf.home2.net, sip:Token(scscf2.home2.net),
      sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 130 PRACK
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Rack: 9022 127 INVITE
Content-Length: 0
```

37. PRACK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-37

S-CSCF#1 forwards the PRACK request to I-CSCF#2.

Table 17.3.4.1-37: PRACK (S-CSCF to I-CSCF)

```
PRACK sip:icscf.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

38. PRACK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-38

I-CSCF#2 determines the routing information, and forwards the PRACK request to S-CSCF#2.

Table 17.3.4.1-38: PRACK (I-CSCF to S-CSCF)

```
PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
      pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

39. PRACK (S-S#1d to MT) – see example in table 17.3.4.1-39

S-CSCF#2 forwards the PRACK request to the terminating endpoint.

Table 17.3.4.1-39: PRACK (S-S#1d to MT)

```
PRACK sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    cscf.home1.net, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Rack:
Content-Length:
```

40. 200 OK (MT to S-S#1d) – see example in table 17.3.4.1-40

The terminating endpoint responds to the PRACK request (39) with a 200 OK response.

Table 17.3.4.1-40: 200 OK (MT to S-S#1d)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aeee%3aff%3aaaa%3abbb%5d@pcscf2.home2.net
Content-Length: 0
```

41. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-41

S-CSCF#2 forwards the 200 OK response to I-CSCF#2.

Table 17.3.4.1-41: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

42. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-42

I-CSCF#2 forwards the 200 OK response to S-CSCF#1.

Table 17.3.4.1-42: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

43. 200 OK (S-S#1d to MO) – see example in table 17.3.4.1-43

S-CSCF#1 forwards the 200 OK response to the originating endpoint.

Table 17.3.4.1-43: 200 OK (S-S#1d to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

44. 200 OK (MT to S-S#1d) – see example in table 17.3.4.1-44

The final response to the INVITE (10), 200 OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session attempt. The response is sent to S-CSCF#2 per the termination procedure.

Table 17.3.4.1-44: 200 OK (MT to S-S#1d)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq: 127 INVITE
Contact: sip:%5b5555%3a%3aeee%3affff%3aaaa%3abbb%5d@pcscf2.home2.net
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:succcess sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

45. Service Control

S-CSCF#2 performs whatever service control logic is appropriate for this session completion.

46. 200 OK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-46

The 200 OK response is forwarded to the I-CSCF#2.

Table 17.3.4.1-46: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

47. 200 OK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-47

The 200 OK response is forwarded to S-CSCF#1.

Table 17.3.4.1-47: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

Record-Route: Formed by I-CSCF#2 reversing and translating all the entries to the left of its own entry.

48. Service Control

S-CSCF#1 performs whatever service control logic is appropriate for this session completion.

49. 200 OK (S-S#1d to MO) – see example in table 17.3.4.1-49

The 200 OK response is returned to the originating endpoint, by the origination procedure.

Table 17.3.4.1-49: 200 OK (S-S#1d to MO)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=
```

50. ACK (MO to S-S#1d) – see example in table 17.3.4.1-50

The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

Table 17.3.4.1-50: ACK (MO to S-S#1d)

```
ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:icscf.home2.net, sip:Token(scscf2.home2.net),
      sip:%5b5555%3a%3aeee%3afff%3aaaa%3abb%5d@pcscf2.home2.net
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 ACK
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.home1.net
Content-Length: 0
```

51. ACK (S-CSCF to I-CSCF) – see example in table 17.3.4.1-51

S-CSCF#1 forwards the ACK request to I-CSCF#2.

Table 17.3.4.1-51: ACK (S-CSCF to I-CSCF)

```
ACK sip:icscf.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeee%3afff%3aaaa%3abb%5d@pcscf2.home2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:
```

52. ACK (I-CSCF to S-CSCF) – see example in table 17.3.4.1-52

I-CSCF#2 forwards the ACK request to S-CSCF#2.

Table 17.3.4.1-52: ACK (I-CSCF to S-CSCF)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net
Record-Route: sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

53. ACK (S-S#1d to MT) – see example in table 17.3.4.1-53

S-CSCF#2 forwards the ACK request to the terminating endpoint, as per the termination procedure.

Table 17.3.4.1-53: ACK (S-S#1d to MT)

```

ACK sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf.home2.net, SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:icscf.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

17.3.4.2 Termination failure (not provided)

An example of this flow is not shown in the present document.

17.3.4.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

17.3.5 Not applicable

Void.

17.3.6 S-S#3**17.3.6.1 (S-S#3) PSTN Termination performed by home network of originator (not provided)**

An example of this flow is not shown in the present document.

17.3.7 S-S#4**17.3.7.1 (S-S#4) PSTN Termination performed by different operator than origination (not provided)**

An example of this flow is not shown in the present document.

17.4 Termination procedures

17.4.1 Introduction

See subclause 7.4.1.

17.4.2 MT#1b

17.4.2.1 (MT#1b) Mobile termination, roaming (MO#2, S-S#2 assumed)

Figure 17.4.2.1-1 shows a termination procedure which applies to roaming subscribers when the home network operator desires to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the P-CSCF discovery procedure. During registration, the home network allocates a S-CSCF. The home network advertises an I-CSCF as the entry point from the visited network, who protects the S-CSCF identity and forwards requests to the P-CSCF.

When registration is complete, S-CSCF knows the name/address of its next hop in the signalling path toward the UE, the I-CSCF, and the S-CSCF knows the UE Contact address. I-CSCF receives information in the request, which it translates and obtains the name/address of P-CSCF, and P-CSCF obtains the name/address of the UE.

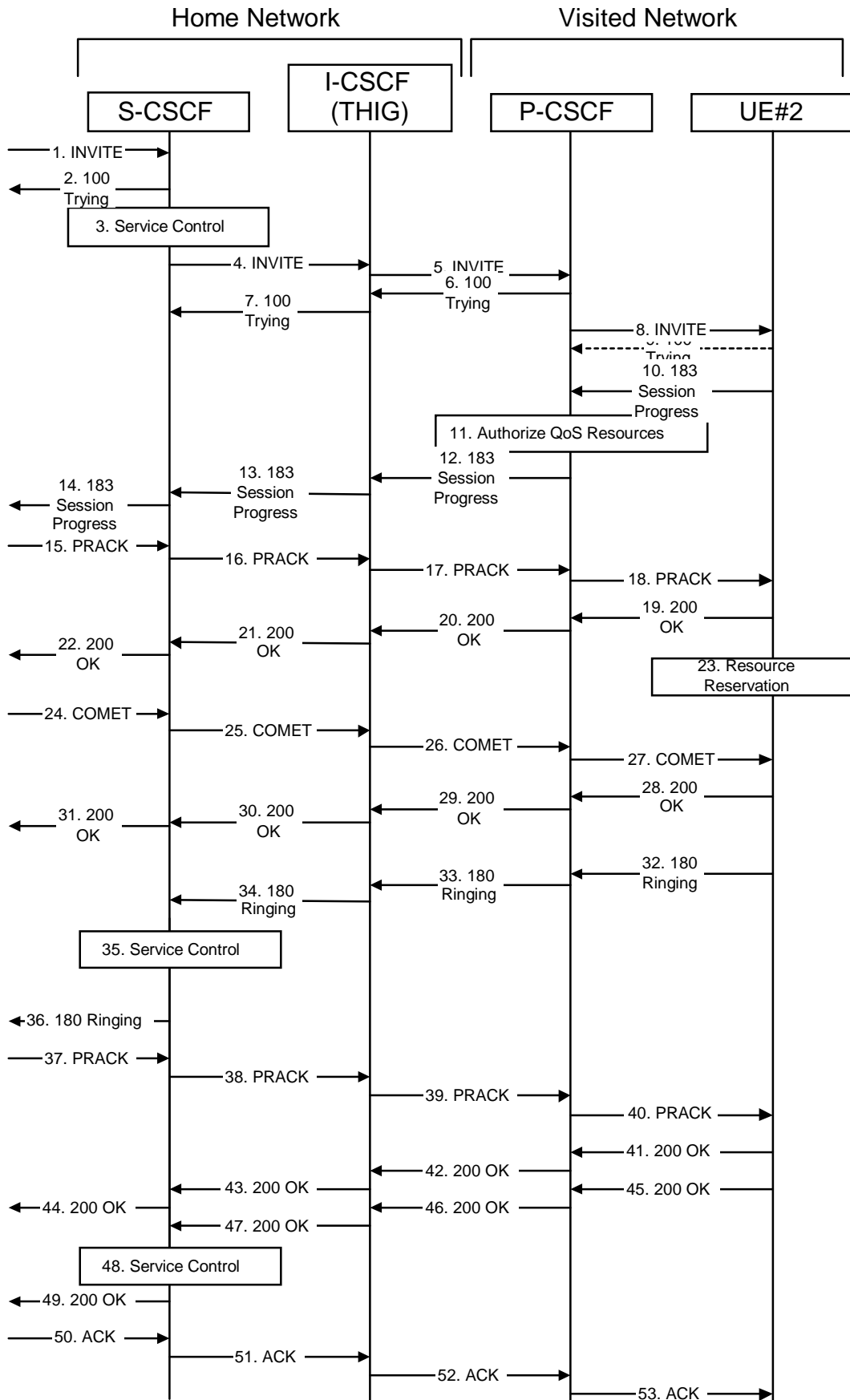


Figure 17.4.2.1-1: MT#1b

Procedure MT#1b is as follows:

1. INVITE (S-S to MT#1b) – see example in table 17.4.2.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 17.4.2.1-1: INVITE (S-S to MT#1b)

```

INVITE sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv
m=audio 3458 RTP/AVP 97 96 0 15
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=qos:mandatory sendrecv

```

SDP

The SDP contains the complete set of supported codecs from the session originator, as restricted by the originating network operator. The "m=" lines for the video media streams show a port number zero, which removes them from the negotiation.

Upon receipt of the INVITE, the S-CSCF stores the following information about this session, for use in providing enhanced services or in possible error recovery actions – see example in table 17.4.2.1-1b.

Table 17.4.2.1-1b: Storage of information at S-CSCF

```

Request-URI: sip:+1-212-555-2222@home1.net;user=phone
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net,
sip:[5555::aaa:bbb:ccc:ddd]
Route(2dest): sip:icscf2_p.home1.net, sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]

```

2. 100 Trying (MT#1b to S-S) – see example in table 17.4.2.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.4.2.1-2: 100 Trying (MT#1b to S-S)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

For this example, assume the destination subscriber is not allowed stereo, so only a single audio stream is permitted.

4. INVITE (S-CSCF to I-CSCF) – see example in table 17.4.2.1-4

S-CSCF remembers (from the registration procedure) the UE Contact address and the next hop CSCF for this UE. It forwards the INVITE to the I-CSCF to perform the THIG functions.

Table 17.4.2.1-4: INVITE (S-CSCF to I-CSCF)

```
INVITE sip:icscf2_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

Via/Record-Route: S-CSCF adds itself in the Record-Route and Via headers.

SDP The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the second audio stream shows a port number zero, which removes it from the negotiation.

Request-URI: Built from the registration information.

Route: Built from the Contact address stored at registration.

P-Called-Party-ID: Includes the dialled URL with its parameters.

5. INVITE (I-CSCF to P-CSCF) – see example in table 17.4.2.1-5

I-CSCF translates the Via headers in the request, and forwards the INVITE request to P-CSCF.

Table 17.4.2.1-5: INVITE (I-CSCF to P-CSCF)

```
INVITE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
Token(scscf2.home1.net;branch=764z87.1, icscf2_s.home1.net;branch=871y12.1,
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:a9012.1@icscf2_p.home1.net, sip:Token(764z87.1@scscf2.home1.net,
332b23.1@scscf1.home1.net), sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
m=
m=
b=
a=
a=
a=
a=
m=
```

Via: Translated to preserve configuration independence of the home network.

Record-Route: Translated to preserve configuration independence of the home network.

Upon receipt of the INVITE, the P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the information for this session is – see example in table 17.4.2.1-5b:

Table 17.4.2.1-5b: Storage of information at P-CSCF

```
Request-URI: sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
seq=72))@localhost>; tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:[5555::eee:fff:aaa:bbb]
Route(2orig): sip:a9012.1@icscf2_p.home1.net,
sip:Token(764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
sip:431h23.1@pcscf1.home1.net), sip:[5555::aaa:bbb:ccc:ddd]
```

6. 100 Trying (P-CSCF to I-CSCF) – see example in table 17.4.2.1-6

P-CSCF responds to the INVITE request (5) with a 100 Trying provisional response.

Table 17.4.2.1-6: 100 Trying (P-CSCF to I-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP Token(scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 17.4.2.1-7

I-CSCF determines the Via header, and forwards the 100 Trying provisional response to S-CSCF.

Table 17.4.2.1-7: 100 Trying (I-CSCF to S-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

8. INVITE (P-CSCF to UE) – see example in table 17.4.2.1-8

P-CSCF examines the media parameters, and removes any that the network operator decides, based on local policy, not to allow on the network.

For this example, assume the network operator does not allow 64 kb/s audio, so the PCMU codec is removed.

The P-CSCF extract the UE address from the Route header value and place it into the Request-URI and forwards the INVITE request to the UE. table 17.4.2.1-8: INVITE (P-CSCF to UE).

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::aaa:bbb:ccc:ddd
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4 96 15
a=qos:mandatory sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15
```

P-CSCF removes the Record-Route and Via headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```
Route: sip:a9012.1@icscf2_p.home1.net, sip:Token(764z87.1@scscf2.home1.net,
scscf2.home1.net), sip:431h23.1@pcscf1.home1.net
```

- Via:** P-CSCF removes the Via headers, and generates a locally unique token to identify the saves values. It inserts this as a branch value on its Via header.
- Media-Authorization:** A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".
- SDP** The SDP contains the restricted set of codecs allowed by the network operator. The "m=" lines for the first audio stream no longer contains codec "0" (PCMU), which removes it from the negotiation.

9. 100 Trying (UE to P-CSCF) – see example in table 17.4.2.1-9

UE may optionally send a 100 Trying provisional response to P-CSCF.

Table 17.4.2.1-9: 100 Trying (UE to P-CSCF)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. 183 Session Progress (UE to P-CSCF) – see example in table 17.4.2.1-10

UE#2 determines the complete set of codecs that it is capable of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE request. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

For this example, assume UE#2 supports both AMR and G726, but not G728 (code 15).

UE responds with a 183 Session Progress response containing SDP back to the originator. This SDP may represent one or more media for a multimedia session. This response is sent to P-CSCF.

Table 17.4.2.1-10: 183 Session Progress (UE to P-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
a=rtpmap:96 G726-32/8000
m=audio 0 RTP/AVP 97 96 0 15

```

- Remote-Party-ID:** Identifies the answering subscriber. It contains the public user identity, and the name of the answering party.
- To:** A tag is added to the To header.
- Contact:** Identifies the IP address or FQDN of the UE.
- SDP** The SDP contains the subset of codecs supported by UE. It requests a confirmation of the QoS preconditions for establishing the session

11. Authorize QoS Resources

P-CSCF authorizes the resources necessary for this session.

12. 183 Session Progress (P-CSCF to I-CSCF) – see example in table 17.4.2.1-12

P-CSCF forwards the 183 Session Progress response to I-CSCF.

Table 17.4.2.1-12: 183 Session Progress (P-CSCF to I-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP Token(764z87.1@scscf2.home1.net,
    icscf2_s.home1.net, scscf1.home1.net), SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
    sip:Token(764z87.1@scscf2.home1.net, 332b23.1@scscf1.home1.net), sip:431h23.1@pcscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=
```

P-CSCF restores the Via headers and Record-Route headers from the branch value in its Via.

13. 183-Session-Progress (I-CSCF to S-CSCF) – see example in table 17.4.2.1-13

I-CSCF determines the Via and Record-Route headers, and forwards the response to S-CSCF.

Table 17.4.2.1-13: 183 Session Progress (I-CSCF to S-CSCF)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: 361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
    sip:a9012.1@iscscf2.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

14. 183 Session Progress (MT#1b to S-S) – see example in table 17.4.2.1-14

S-CSCF forwards the 183 Session Progress response to the originator, per the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-14: 183 Session Progress (MT#1b to S-S)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
m=

```

15. PRACK (S-S to MT#1b) – see example in table 17.4.2.1-15

The originating endpoint sends a PRACK request containing the final SDP to be used in this session, via the S-CSCF to S-CSCF procedure, to S-CSCF.

Table 17.4.2.1-15: PRACK (S-S to MT#1b)

```

PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:a9012.1@icscf2_p.home1.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 128 PRACK
Rack: 9021 127 INVITE
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=audio 0 RTP/AVP 97 96 0 15

```

16. PRACK (S-CSCF to I-CSCF) – see example in table 17.4.2.1-16

S-CSCF forwards the PRACK request to I-CSCF.

Table 17.4.2.1-16: PRACK (S-CSCF to I-CSCF)

```

PRACK sip:icscf2_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

17. PRACK (I-CSCF to P-CSCF) – see example in table 17.4.2.1-17

I-CSCF translates the Via headers in the PRACK request, and forwards the request to P-CSCF.

Table 17.4.2.1-17: PRACK (I-CSCF to P-CSCF)

```

PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
      Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
      pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: Translated to preserve configuration independence of the home network.

18. PRACK (P-CSCF to UE) – see example in table 17.4.2.1-18

P-CSCF forwards the PRACK request to UE.

Table 17.4.2.1-18: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

19. 200 OK (UE to P-CSCF) – see example in table 17.4.2.1-19

UE acknowledges the PRACK request (18) with a 200 OK response.

Table 17.4.2.1-19: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

20. 200 OK (P-CSCF to I-CSCF) – see example in table 17.4.2.1-20

P-CSCF forwards the 200 OK response to I-CSCF.

Table 17.4.2.1-20: 200 OK (P-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

Via: P-CSCF restores the Via headers from saved values, based on the token value in the branch parameter of its Via.

21. 200 OK (I-CSCF to S-CSCF) – see example in table 17.4.2.1-21

I-CSCF determines the Via and Record-Route headers, and forwards the 200 OK response to S-CSCF.

Table 17.4.2.1-21: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

22. 200 OK (MT#1b to S-S) – see example in table 17.4.2.1-22

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-22: 200 OK (MT#1b to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

23. Resource Reservation

UE initiates the reservation procedures for the resources needed for this session.

24. COMET (S-S to MT#1b) – see example in table 17.4.2.1-24

When the originating endpoint has completed its resource reservation, it sends the COMET request to S-CSCF, via the S-CSCF to S-CSCF procedures.

Table 17.4.2.1-24: COMET (S-S to MT#1b)

```

COMET sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:a9012.1@icscf2_p.home1.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From: "Alien Blaster" <sip:B36(SHA-1(555-1111; time=36123E5B; seq=72))@localhost>;tag=171828
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 129 COMET
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=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:succes sendonly
m=audio 0 RTP/AVP 97 96 0 15

```

25. COMET (S-CSCF to I-CSCF) – see example in table 17.4.2.1-25

S-CSCF forwards the COMET request to I-CSCF.

Table 17.4.2.1-25: COMET (S-CSCF to I-CSCF)

```

COMET sip:icscf2_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

26. COMET (I-CSCF to P-CSCF) – see example in table 17.4.2.1-26

I-CSCF translates the Via headers in the COMET request, and forwards the request to P-CSCF.

Table 17.4.2.1-26: COMET (I-CSCF to P-CSCF)

```

COMET sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: Translated to preserve configuration independence of the home network.

Record-Route: Translated to preserve configuration independence of the home network.

27. COMET (P-CSCF to UE) – see example in table 17.4.2.1-27

P-CSCF forwards the COMET request to UE.

Table 17.4.2.1-27: COMET (P-CSCF to UE)

```

COMET sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

28. 200 OK (UE to P-CSCF) – see example in table 17.4.2.1-28

UE acknowledges the COMET request (27) with a 200 OK response.

Table 17.4.2.1-28: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

29. 200 OK (P-CSCF to I-CSCF) – see example in table 17.4.2.1-29

P-CSCF forwards the 200 OK response to I-CSCF.

Table 17.4.2.1-29: 200 OK (P-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=871y12.1, SIP/2.0/UDP
Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net), SIP/2.0/UDP
pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

P-CSCF restores the Via headers from saved values, based on the token value in the branch parameter of its Via.

30. 200 OK (I-CSCF to S-CSCF) – see example in table 17.4.2.1-30

I-CSCF determines the Via and Record-Route headers, and forwards the 200 OK to S-CSCF

Table 17.4.2.1-30: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

31. 200 OK (MT#1b to S-S) – see example in table 17.4.2.1-31

S-CSCF forwards the 200 OK response to the originator, per the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-31: 200 OK (MT#1b to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

32. 180 Ringing (UE to P-CSCF) – see example in table 17.4.2.1-32 (related to 17.4.2.1-8)

Before proceeding with session establishment, the UE waits for two events. First, the resource reservation initiated in step #23 must complete successfully. Second, the resource reservation initiated by the originating endpoint must complete successfully (which is indicated by message #27 received by UE). The UE may now immediately accept the session (and proceed with step #45), or alert the destination subscriber of an incoming session attempt; if the latter it indicates this to the calling party by a 180 Ringing provisional response sent to P-CSCF.

Table 17.4.2.1-32: 180 Ringing (UE to P-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Length: 0
```

33. 180 Ringing (P-CSCF to I-CSCF) – see example in table 17.4.2.1-33

P-CSCF forwards the 180 Ringing response to I-CSCF.

Table 17.4.2.1-33: 180 Ringing (P-CSCF to I-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
Token(scscf2.home1.net;branch=764z87.1, icscf2_s.home1.net;branch=871y12.1, scscf1.home1.net)
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
sip:Token(764z87.1@scscf2.home1.net, 332b23.1@scscf1.home1.net), sip:431h23.1@pcscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

34. 180 Ringing (I-CSCF to S-CSCF) – see example in table 17.4.2.1-34

I-CSCF determines the Via and Record-Route headers, and forwards the 180 Ringing response to S-CSCF.

Table 17.4.2.1-34: 180 Ringing (I-CSCF to S-CSCF)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:871y12.1@icscf2_s.home1.net,
sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

35. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

36. 180 Ringing (MT#1b to S-S) – see example in table 17.4.2.1-36

S-CSCF forwards the 180 Ringing response to the originating endpoint, per the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-36: 180 Ringing (MT#1b to S-S)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Length:
```

37. PRACK (S-S to MT#1b) – see example in table 17.4.2.1-37

The originator acknowledges the 180 Ringing response (36) with a PRACK request.

Table 17.4.2.1-37: PRACK (S-S to MT#1b)

```
PRACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:a9012.1@icscf2_p.home1.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 130 PRACK
Rack: 9022 127 INVITE
Content-Length: 0
```

38. PRACK (S-CSCF to I-CSCF) – see example in table 17.4.2.1-38

S-CSCF forwards the PRACK request to I-CSCF.

Table 17.4.2.1-38: PRACK (S-CSCF to I-CSCF)

```
PRACK sip:icscf2_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

39. PRACK (I-CSCF to P-CSCF) – see example in table 17.4.2.1-39

I-CSCF translates the Via headers in the PRACK request, and forwards the request to P-CSCF.

Table 17.4.2.1-39: PRACK (I-CSCF to P-CSCF)

```

PRACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

Via: Translated to preserve configuration independence of the home network.

Record-Route: Translated to preserve configuration independence of the home network.

40. PRACK (P-CSCF to UE) – see example in table 17.4.2.1-40

P-CSCF forwards the PRACK request to UE.

Table 17.4.2.1-40: PRACK (P-CSCF to UE)

```

PRACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

41. 200 OK (UE to P-CSCF) – see example in table 17.4.2.1-41

UE acknowledges the PRACK request (40) with a 200 OK response.

Table 17.4.2.1-41: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

42. 200 OK (P-CSCF to I-CSCF) – see example in table 17.4.2.1-42

P-CSCF forwards the 200 OK to I-CSCF.

Table 17.4.2.1-42: 200 OK (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

43. 200 OK (I-CSCF to S-CSCF) – see example in table 17.4.2.1-43

I-CSCF determines the Via and Record-Route headers, and forwards the 200 OK response to S-CSCF.

Table 17.4.2.1-43: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

44. 200 OK (MT#1b to S-S) – see example in table 17.4.2.1-44

S-CSCF forwards the 200 OK to the session originator, per the S-CSCF to S-CSCF procedures.

Table 17.4.2.1-44: 200 OK (MT#1b to S-S)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

45. 200 OK (UE to P-CSCF) – see example in table 17.4.2.1-45 (related to 17.4.2.1-8)

When the called party answers, the UE sends a 200 OK final response to the INVITE request (8) to P-CSCF, and starts the media flow(s) for this session.

Table 17.4.2.1-45: 200 OK (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq: 127 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Content-type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907165275 0
m=video 0 RTP/AVP 99
m=video 0 RTP/AVP 99
m=audio 6544 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=audio 0 RTP/AVP 97 96 0 15
```

46. 200 OK (P-CSCF to I-CSCF) – see example in table 17.4.2.1-46

P-CSCF indicates the resources reserved for this session should now be committed, and sends the 200 OK final response to I-CSCF.

Table 17.4.2.1-46: 200 OK (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
      Token(scscf2.home1.net;branch=764z87.1, icscf2_s.home1.net;branch=871y12.1, scscf1.home1.net),
      SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:871y12.1@icscf2_s.home1.net,
      sip:Token(764z87.1@scscf2.home1.net, scscf1.home1.net), sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

47. 200 OK (I-CSCF to S-CSCF) – see example in table 17.4.2.1-47

I-CSCF determines the Via and Record-Route headers, and forwards the 200 OK response to S-CSCF.

Table 17.4.2.1-47: 200 OK (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
      SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
      SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
      sip:764z87.1@iscscf2.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

48. Service Control

S-CSCF performs whatever service control is required for the session completion.

49. 200 OK (MT#1b to S-S) – see example in table 17.4.2.1-49

S-CSCF forwards the 200 OK final response along the signalling path back to the session originator, as per the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-49: 200 OK (MT#1b to S-S)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
m=

```

50. ACK (S-S to MT#1b) – see example in table 17.4.2.1-50

The calling party responds to the 200 OK final response (49) with an ACK request which is sent to S-CSCF via the S-CSCF to S-CSCF procedure.

Table 17.4.2.1-50: ACK (S-S to MT#1b)

```

ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:a9012.1@icscf2_p.home1.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq: 127 ACK
Content-Length: 0

```

51. ACK (S-CSCF to I-CSCF) – see example in table 17.4.2.1-51

S-CSCF forwards the ACK request to I-CSCF.

Table 17.4.2.1-51: ACK (S-CSCF to I-CSCF)

```

ACK sip:icscf2_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

52. ACK (I-CSCF to P-CSCF) – see example in table 17.4.2.1-52

I-CSCF forwards the ACK request to P-CSCF.

Table 17.4.2.1-52: ACK (I-CSCF to P-CSCF)

```

ACK sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, scscf1.home1.net), SIP/2.0/UDP
    pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Contact:
Content-Length:

```

Via: Translated to preserve configuration independence of the home network.

53. ACK (P-CSCF to UE) – see example in table 17.4.2.1-53

P-CSCF forwards the ACK request to UE.

Table 17.4.2.1-53: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
Cseq:
Content-Length:

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saved values. It inserts this as a branch value on its Via header.

17.4.2.2 UE-detected failure/resource failure (not provided)

An example of this flow is not shown in the present document.

17.4.2.3 Origination failure (not provided)

An example of this flow is not shown in the present document.

17.4.3 Not applicable

Void.

17.4.4 Not required

Void.

17.4.5 MT#1d

17.4.5.1 (MT#1d) Mobile termination, roaming, with I-CSCF in home network providing configuration independence, terminating UE is busy, and not able or not willing to answer the call (MO#2, S-S#2 assumed)

Figure 17.4.5.1-1 shows a termination procedure which applies to roaming subscribers when the home network operator does not desire to keep its internal configuration hidden from the visited network. The UE is located in a visited network, and determines the P-CSCF via the P-CSCF discovery procedure. During registration, the home network allocates the S-CSCF.

When registration is complete, S-CSCF knows the name/address of P-CSCF and the UE Contact address, and P-CSCF obtains the name/address of the UE.

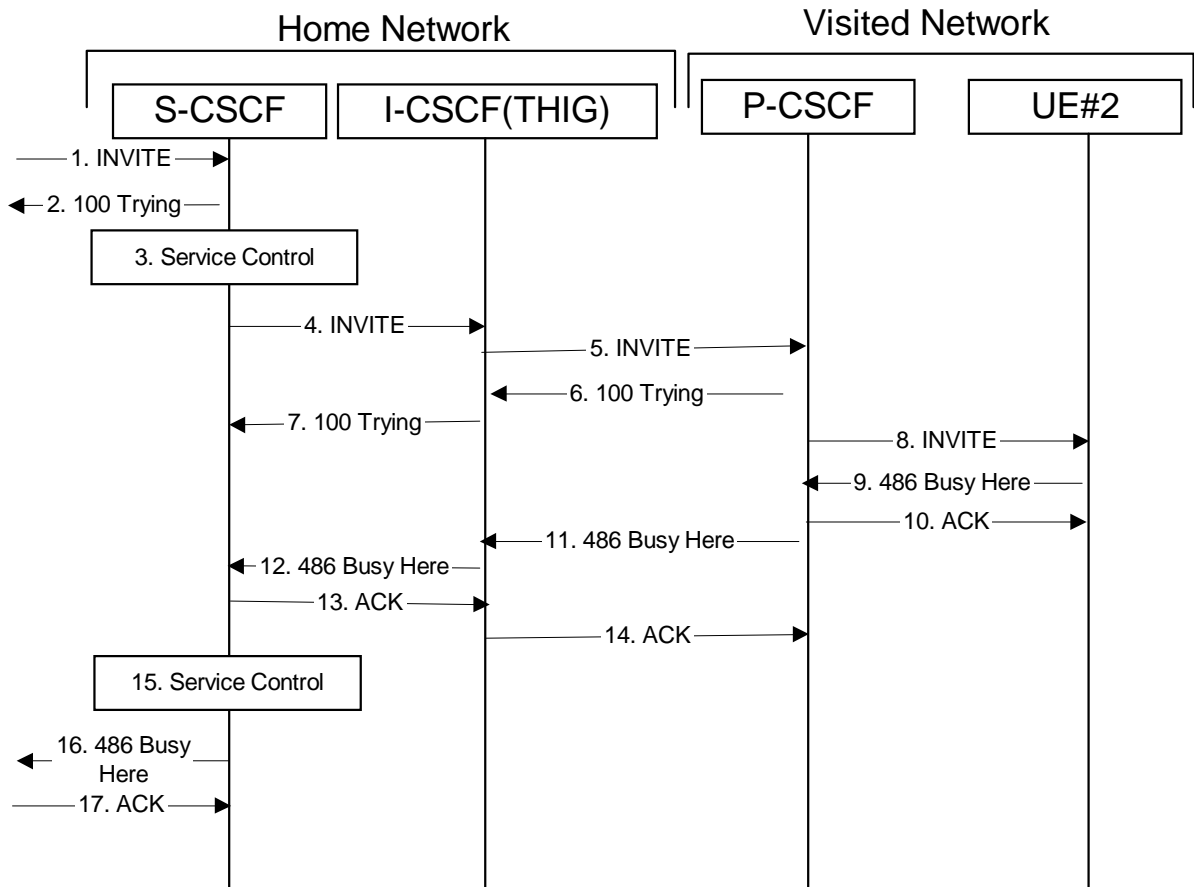


Figure 17.4.5.1-1: MT#1d

Procedure MT#1d is as follows:

1. INVITE (S-S to MT#1d) – see example in table 17.4.5.1-1

The calling party sends the INVITE request, via one of the origination procedures and via one of the S-CSCF to S-CSCF procedures, to the S-CSCF for the terminating subscriber.

Table 17.4.5.1-1: INVITE (S-S to MT#1d)

```

INVITE sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
Route: sip:+1-212-555-2222@home1.net;user=phone
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B;
    seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907165275 0
m=audio 3456 RTP/AVP 97 3 96
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
a=gos:mandatory sendrecv

```

2. 100 Trying (MT#1d to S-S) – see example in table 17.4.5.1-2

S-CSCF responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.4.5.1-2: 100 Trying (MT#1d to S-S)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
    SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. Service Control

S-CSCF validates the service profile, and performs any termination service control required for this subscriber.

S-CSCF examines the media parameters, and removes any choices that the destination subscriber does not have authority to request.

4. INVITE (S-CSCF to I-CSCF) – see example in table 17.4.5.1-4

S-CSCF remembers (from the registration procedure) the UE Contact address and the next hop CSCF for this UE. It forwards the INVITE to the I-CSCF to perform the THIG functions.

Table 17.4.5.1-4: INVITE (S-CSCF to I-CSCF)

```

INVITE sip:icscf2_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID: <sip:+1-212-555-2222@home1.net;user=phone>
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

- Route:** Built from the Contact address stored at registration.
- P-Called-Party-ID:** Includes the dialled URL with its parameters.
- Via/Record-Route:** S-CSCF adds itself in the Record-Route and Via headers.

5. INVITE (I-CSCF to P-CSCF) – see example in table 17.4.5.1-5

I-CSCF translates the Via headers in the request, and forwards the INVITE request to P-CSCF.

Table 17.4.5.1-5: INVITE (I-CSCF to P-CSCF)

```

INVITE sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:[5555::eee:fff:aaa:bbb]
Record-Route: sip:a9012.1@icscf2_p.home1.net, sip:Token(764z87.1@scscf2.home1.net,
    sip:332b23.1@scscf1.home1.net), sip:431h23.1@pcscf1.home1.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

Via: Translated to preserve configuration independence of the home network.

Record-Route: Translated to preserve configuration independence of the home network.

6. 100 Trying (P-CSCF to I-CSCF) – see example in table 17.4.5.1-6

P-CSCF responds to the INVITE request (5) with a 100 Trying provisional response.

Table 17.4.5.1-6: 100 Trying (P-CSCF to I-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

7. 100 Trying (I-CSCF to S-CSCF) – see example in table 17.4.5.1-7

I-CSCF determines the Via header, and forwards the 100 Trying provisional response to S-CSCF.

Table 17.4.5.1-7: 100 Trying (I-CSCF to S-CSCF)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

8. INVITE (P-CSCF to UE) – see example in table 17.4.5.1-8

P-CSCF extract the UE address from the Route header value and place it into the Request-URI, and forwards the INVITE request to the UE.

Table 17.4.5.1-8: INVITE (P-CSCF to UE)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363231
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=

```

P-CSCF removes the Record-Route headers, calculates the proper Route header to add to future requests, and saves that information without passing it to UE. The saved value of the Route header is:

```

Route: sip:a9012.1@icscf2_p.home1.net, sip:Token(764z87.1@scscf2.home1.net,
sip:332b23.1@scscf1.home1.net),
sip:[5555::aaa:bbb:ccc:ddd]

```

Via: P-CSCF removes the Via headers, and generates a locally unique token to identify the saves values. It inserts this as a branch value on its Via header.

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14621".

9. 486 Busy Here (UE to P-CSCF) – see example in table 17.4.5.1-9

UE is contacted successfully but it is currently not willing or able to take additional sessions. The response MAY indicate a better time to call in the Retry-After header.

Table 17.4.5.1-9: 486 Busy Here (UE to P-CSCF)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From: To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=1234
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
Retry-After: 3600
Content-Length: 0

```

Retry-After: Indicates how long the caller can try again.

10. ACK (P-CSCF to UE) – see example in table 17.4.5.1-10

Upon receive the 486 response from the UE, P-CSCF sends ACK back to the UE.

Table 17.4.5.1-10: ACK (P-CSCF to UE)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

11. 486 Busy Here (P-CSCF to I-CSCF) – see example in table 17.4.5.1-11 (related to table 17.4.5.1-9)

P-CSCF forwards the 486 response to the I-CSCF.

Table 17.4.5.1-11: 486 Busy Here (P-CSCF to I-CSCF)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
    sip:Token(764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net,
    sip:431h23.1@pcscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Retry-After:
Content-Length:

```

12. 486 Busy Here (I-CSCF to S-CSCF) – see example in table 17.4.5.1-12

I-CSCF forwards the 486 response to the S-CSCF.

Table 17.4.5.1-12: 486 Busy Here (I-CSCF to S-CSCF)

```

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1,
    SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:361k21.1@pcscf2.visited2.net, sip:a9012.1@icscf2_p.home1.net,
    sip:764z87.1@scscf2.home1.net, sip:332b23.1@scscf1.home1.net, sip:431h23.1@pcscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Retry-After:
Content-Length:

```

13. ACK (S-CSCF to I-CSCF) – see example in table 17.4.5.1-13

S-CSCF copies the Request-URI and Route headers from the original INVITE request to ACK and send it to the P-CSCF via I-CSCF.

Table 17.4.5.1-13: ACK (S-CSCF to I-CSCF)

```

ACK: sip:icscf2_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=764z87.1
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

14. ACK (I-CSCF to P-CSCF) – see example in table 17.4.5.1-14

I-CSCF forwards the ACK to the P-CSCF, P-CSCF checks the ACK and makes sure this is for a 4xx response, so P-CSCF will not forward it further down.

Table 17.4.5.1-14: ACK (I-CSCF to P-CSCF)

```
ACK: sip:pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home1.net;branch=a9012.1@ SIP/2.0/UDP
      Token(scscf2.home1.net;branch=764z87.1)
Route: sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

15. Service Control

The S-CSCF validates the service profile and performs any service control required for this subscriber.

16. 486 Busy Here (MT#1d to S-S) – see example in table 17.4.5.1-16 (related to table 17.4.5.1-12)

S-CSCF forwards the 486 response to the originator, per the S-CSCF to S-CSCF procedure.

Table 17.4.5.1-16: 486 Busy Here (MT#1d to S-S)

```
SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=871y12.1, SIP/2.0/UDP scscf1.home1.net;branch=332b23.1,
      SIP/2.0/UDP pcscf1.home1.net;branch=431h23.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route:
From:
To:
Call-ID:
CSeq:
Contact:
Retry-After:3600
Content-Length: 0
```

17. ACK (S-S to MT#1d) – see example in table 17.4.5.1-17

S-CSCF sends the ACK to the S-CSCF.

Table 17.4.5.1-17: ACK (S-S to MT#1d)

```
ACK sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1
Route: sip:+1-212-555-2222@home1.net;user=phone
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

17.5 Sample multimedia signalling flows: addition of further media streams

17.5.1 Introduction

See subclause 7.5.1.

17.5.2 Sample multimedia signalling flow - addition of further media originator and terminator are both roaming and operated by different networks

Figure 17.5.2-1 shows a multimedia signalling flow for the addition of another media where the originator and terminator are both roaming and operated by different networks. Both networks are with I-CSCF providing configuration independence. The UE has already established an IM CN session carrying voice and is generating an INVITE request to add video media to the already established IM session.

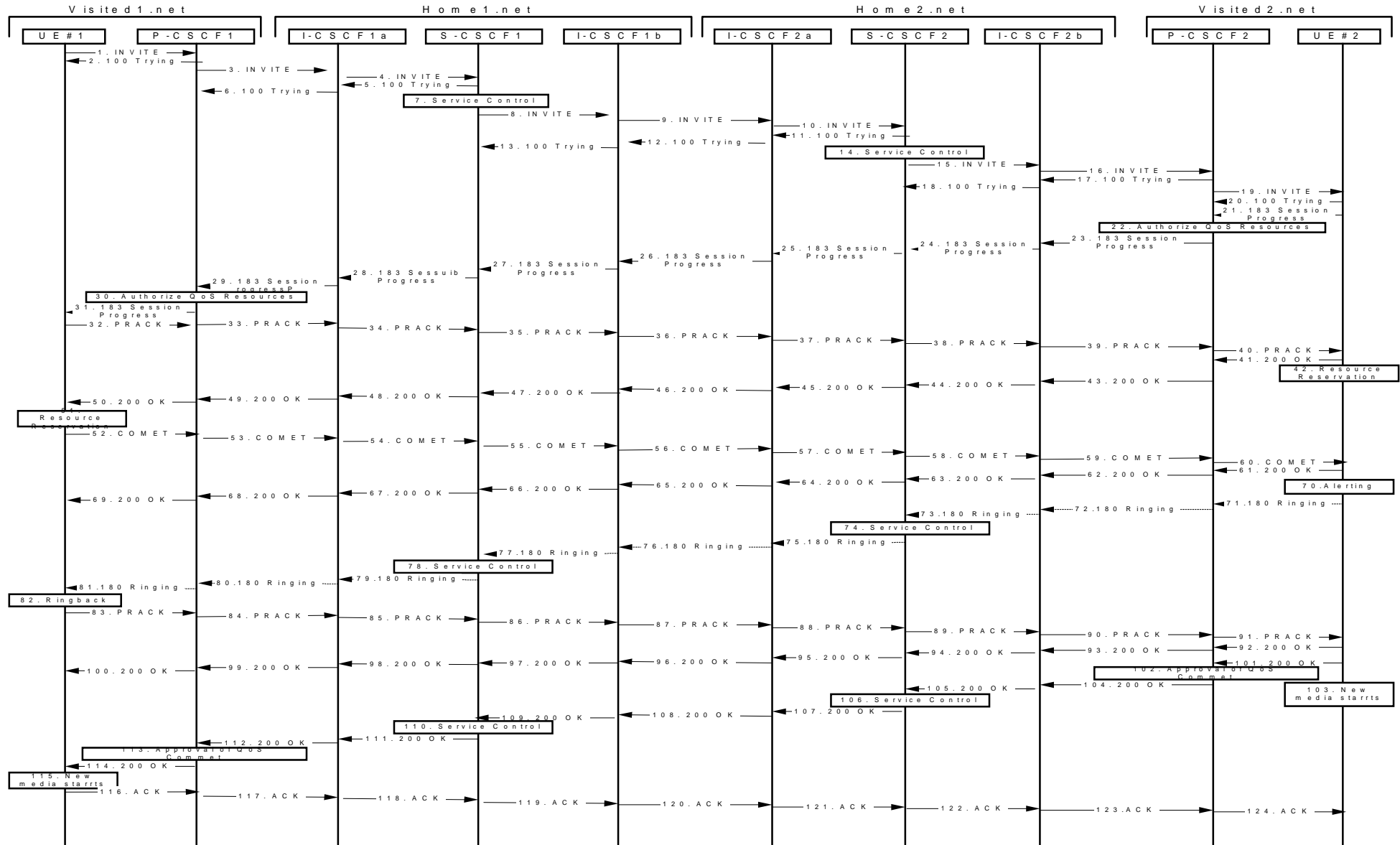


Figure 17.5.2-1: Sample multimedia signalling flow - additional of further media with I-CSCF (THIG)

1. INVITE (UE1 to P-CSCF1) - see example in table 17.5.2-1

UE sends the Re-INVITE request, containing another media description in SDP, to the P-CSCF determined via the CSCF discovery mechanism. An example is contained in table 17.5.2-1.

Table 17.5.2-1: INVITE (UE1 to P-CSCF1)

```

INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Supported: 100rel
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;
Anonymity: Off
From: "Alien Blaster" <sip:B36(SHA-
    1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 132 INVITE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
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=907166275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv

```

- Request-URI:** Contains the keyed number from the user.
- Via:** Contains the IP address or FQDN of the originating UE.
- Remote-Party-ID:** Contains the public user identity. The Display name is optional.
- From:/To:/Call-ID:** Follow the recommendations of draft-ietf-sip-privacy-01, even though anonymity is not being requested for this session.
- Cseq:** Is a random starting number.
- Contact:** Is the IP address or FQDN of the originating UE.

2. 100 Trying (P-CSCF1 to UE1) - see example in table 17.5.2-2

P-CSCF1 responds to the INVITE request (1) with a 100 Trying provisional response.

Table 17.5.2-2: 100 Trying (P-CSCF1 to UE1)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

3. INVITE (P-CSCF1 to I-CSCF1a) - see example in table 17.5.2-3

P-CSCF1 forwards the INVITE to the next hop name/address, as determined from previous response messages.

Table 17.5.2-3: INVITE (P-CSCF1 to I-CSCF1a)

```

INVITE sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:332b23.1@scscf1.home1.net), sip:312a32.1@icscf1_s.home1.net,
      sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

Route: P-CSCF remembers (from the previous response messages) the request routing for this UE. This becomes a Route header in the request. The initial Request-URI is appended to the Route header.

Contact: A locally defined value that identifies the UE.

Request-URI: The first component in the remembered Path header from Registration.

4. INVITE (I-CSCF1a to S-CSCF1) - see example in table 17.5.2-4

I-CSCF1a performs the THIG function and forwards the invite to S-CSCF1.

Table 17.5.2-4: INVITE (I-CSCF1a to S-CSCF1)

```

INVITE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
    sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

5. 100 Trying (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-5

S-CSCF1 sends the 100 Trying provisional response to P-CSCF1 through I-CSCF1a.

Table 17.5.2-5: 100 Trying (S-CSCF1 to I-CSCF1a)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

6. 100 Trying (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-6

I-CSCF1a forwards the 100 Trying provisional response to P-CSCF1.

Table 17.5.2-6: 100 Trying (I-CSCF1a to P-CSCF1)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

7. Service Control

S-CSCF1 validates the service profile, and performs any origination service control required for this subscriber.

8. INVITE (S-CSCF1 to I-CSCF1b) - see example in table 17.5.2-8

S-CSCF1 recognizes that this invite applies to an existing session. It therefore forwards the INVITE along the existing path to I-CSCF1b.

Table 17.5.2-8: INVITE (S-CSCF1 to I-CSCF1b)

```

INVITE sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
    sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;privacy=off;screen=yes
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

9. INVITE (I-CSCF1b to I-CSCF2a) - see example in table 17.5.2-9

I-CSCF1b forwards the INVITE request to the next hop I-CSCF2a and performs the THIG function.

Table 17.5.2-9: INVITE (I-CSCF1b to I-CSCF2a)

```

INVITE sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=

```

a=

10. INVITE (I-CSCF2a to S-CSCF2) - see example in table 17.5.2-10

I-CSCF2a forwards the INVITE request to S-CSCF2.

Table 17.5.2-10: INVITE (I-CSCF2a to S-CSCF2)

```

INVITE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:556u87.1@icscf2_p.home2.net, sip:36lk21.1@pcscf2.visited2.net,
    sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

11. 100 Trying (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-11

S-CSCF2 sends a 100 Trying provisional response back to S-CSCF1 through I-CSCF2a.

Table 17.5.2-11: 100 Trying (S-CSCF2 to I-CSCF2a)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1,
    SIP/2.0/UDP, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

12. 100 Trying (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-12

I-CSCF2a forwards a 100 Trying provisional response to the upstream next hop I-CSCF1b.

Table 17.5.2-12: 100 Trying (I-CSCF2a to I-CSCF1b)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

13. 100 Trying (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-13

I-CSCF forwards a 100 Trying provisional response to the S-CSCF1.

Table 17.5.2-13: 100 Trying (I-CSCF1b to S-CSCF1)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

14. Service Control

S-CSCF2 validates the service profile, and performs any origination service control required for this subscriber.

15. INVITE (S-CSCF2 to I-CSCF2b) - see example in table 17.5.2-15

S-CSCF2 recognizes that this invite applies to an existing session. It therefore forwards the INVITE along the existing path to I-CSCF2b.

Table 17.5.2-15: INVITE (S-CSCF2 to I-CSCF2b)

```
INVITE sip:icscf2_p.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.l@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length: (...)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

16. INVITE (I-CSCF2b to P-CSCF2) - see example in table 17.5.2-16

I-CSCF2b performs the THIG function and forwards the INVITE request to P-CSCF2.

Table 17.5.2-16: INVITE (I-CSCF2 to P-CSCF2)

```

INVITE sip:sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
  scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
  icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
  scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
  pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: user2_public1@home2.net
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

17. 100 Trying (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-17

P-CSCF2 sends a 100 Trying provisional response back to S-CSCF2 through I-CSCF2b.

Table 17.5.2-17: 100 Trying (P-CSCF2 to I-CSCF2b)

```

SIP/2.0 100 Trying
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
  scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
  icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
  scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
  pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

18. 100 Trying (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-18

I-CSCF2b forwards a 100 Trying provisional response back to S-CSCF2.

Table 17.5.2-18: 100 Trying (I-CSCF2b to S-CSCF2)

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

19. INVITE (P-CSCF2 to UE2) - see example in table 17.5.2-19

P-CSCF determines the UE address from the value of the Request-URI (which was previously returned by P-CSCF as a contact header value in the registration procedure), and forwards the INVITE request to the UE.

Table 17.5.2-19: INVITE (P-CSCF2 to UE2)

```
INVITE sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Media-Authorization: 0020000100100101706366322e78797a2e6e6574000c020133315331343363233
Supported:
Remote-Party-ID:
Anonymity:
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf2.xyz.net" with credentials "31S14623".

20. 100 Trying (UE2 to P-CSCF2) - see example in table 17.5.2-20

UE2 sends a 100 Trying provisional response back to P-CSCF2.

Table 17.5.2-20: 100 Trying (UE2 to P-CSCF2)

```
SIP/2.0 100 Trying
Via: pcscf2.visited2.net;branch=token2 SIP/2.0/UDP
From:
To:
Call-ID:
CSeq:
```

21. 183 Session Progress (UE2 to P-CSCF2) - see example in table 17.5.2-21

The media stream capabilities of the destination are returned along the signalling path, in a 183 Session Progress provisional response.

Table 17.5.2-21: 183 Session Progress response (UE2 to P-CSCF2)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off
Anonymity: Off
Require: 100rel
From:
To: sip:B36(SHA-1(+1-212-555-2222; time=36123E5B; seq=73))@localhost; tag=314159
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
Content-Disposition: precondition
Content-Type: application/sdp
Content-Length: (...)

v=0
o=- 2987933615 2987933615 IN IP6 5555::aaa:bbb:ccc:ddd
s=-
c=IN IP6 5555::eee:fff:aaa:bbb
t=907166275 0
m=audio 6544 RTP/AVP 97
b=AS:25.4 3
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:mandatory sendrecv confirm
m=video 7544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv confirm

```

22. Authorize QoS Resources

P-CSCF2 authorizes the resources necessary for this new media.

23. 183 Session Progress (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-23

P-CSCF forwards the 183 Session Progress response to P-CSCF.

Table 17.5.2-23: 183 Session Progress (P-CSCF2 to I-CSCF2b)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact: sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

24. 183 Session Progress (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-24

I-CSCF2b forwards the 183 Session Progress response to S-CSCF2.

Table 17.5.2-24: 183 Session Progress (I-CSCF2b to S-CSCF2)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

25. 183 Session Progress (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-25

S-CSCF2 forwards the 183 Session Progress response to I-CSCF2a.

Table 17.5.2-25: 183 Session Progress (S-CSCF2 to I-CSCF2a)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>;privacy=off;screen=yes
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

26. 183 Session Progress (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-26

I-CSCF2a forwards the 183 Session Progress response to I-CSCF1b.

Table 17.5.2-26: 183 Session Progress (I-CSCF2a to I-CSCF1b)

```

SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

27. 183 Session Progress (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-27

I-CSCF1b forwards the 183 Session Progress response to the S-CSCF1.

Table 17.5.2-27: 183 Session Progress (I-CSCF1b to S-CSCF1)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

28. 183 Session Progress (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-28

S-CSCF1 forwards the 183 Session Progress response to I-CSCF1a.

Table 17.5.2-28: 183 Session Progress (S-CSCF1 to I-CSCF1a)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
Anonymity:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Disposition:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

29. 183 Session Progress (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-29

I-CSCF1a forwards the 183 Session Progress response to P-CSCF1.

Table 17.5.2-29: 183 Session Progress (I-CSCF1a to P-CSCF1)

<pre> SIP/2.0 183 Session Progress Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd] Remote-Party-ID: Anonymity: Require: From: To: Call-ID: CSeq: Contact: RSeq: Content-Disposition: Content-Type: Content-Length: v= o= s= c= t= m= b= a= a= a= m= b= a= a= </pre>
--

30. Authorize QoS Resources

P-CSCF1 authorizes the resources necessary for this new media.

31. 183 Session Progress (P-CSCF1 to UE1) - see example in table 17.5.2-31

P-CSCF1 forwards the 183 Session Progress response to the originating endpoint.

Table 17.5.2-31: 183 Session Progress (P-CSCF1 to UE1)

<pre> SIP/2.0 183 Session Progress Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd] Media-Authorization: 0020000100100101706366312e78797a2e6e6574000c02013942563330373400 Remote-Party-ID: Anonymity: Require: From: To: Call-ID: CSeq: Contact: RSeq: Content-Disposition: Content-Type: Content-Length: v= o= s= c= t= m= b= a= a= a= m= b= a= a= </pre>

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcf1.xyz.net" with credentials "9BV3074".

32. PRACK (UE1 to P-CSCF1) - see example in table 17.5.2-32

The originator decides the final set of media streams for this media addition, and sends the Final SDP to P-CSCF1.

Table 17.5.2-32: PRACK (UE1 to P-CSCF1)

```
PRACK sip:token3@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222;time=36123E5B;seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 133 PRACK
Rack: 9022 132 Invite
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=907166275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7;maxframes=2
a=qos:mandatory sendrecv
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:mandatory sendrecv
```

33. PRACK (P-CSCF1 to I-CSCF1a) - see example in table 17.5.2-33

The PRACK request is forwarded through this I-CSCF to the S-CSCF.

Table 17.5.2-33: PRACK (P-CSCF1 to I-CSCF1a)

```
PRACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:332b23.1@scscf1.home1.net), sip:312a32.1@icscf1_s.home1.net,
      sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

34. PRACK (I-CSCF1a to S-CSCF1) - see example in table 17.5.2-34

The PRACK request is forwarded through this I-CSCF1a to the S-CSCF1.

Table 17.5.2-34: PRACK (I-CSCF1a to S-CSCF1)

```

PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
      sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
      sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

35. PRACK (S-CSCF1 to I-CSCF1b) - see example in table 17.5.2-35

S-CSCF1 forwards the PRACK request to I-CSCF1b.

Table 17.5.2-35: PRACK (S-CSCF1 to I-CSCF1b)

```

PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

36. PRACK (I-CSCF1b to I-CSCF2a) - see example in table 17.5.2-36

I-CSCF1b forwards the PRACK request to I-CSCF2a.

Table 17.5.2-36: PRACK (I-CSCF1b to I-CSCF2a)

```

PRACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

37. PRACK (I-CSCF2a to S-CSCF2) - see example in table 17.5.2-37

I-CSCF2a forwards the PRACK request to S-CSCF2.

Table 17.5.2-37: PRACK (I-CSCF2a to S-CSCF2)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net,
    sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

38. PRACK (S-CSCF2 to I-CSCF2b) - see example in table 17.5.2-38

S-CSCF2 forwards the PRACK request to I-CSCF2b.

Table 17.5.2-38: PRACK (S-CSCF2 to I-CSCF2b)

```

PRACK sip:icscf2_p.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

39. PRACK (I-CSCF2b to P-CSCF2) - see example in table 17.5.2-39

I-CSCF1b forwards the PRACK request to P-CSCF2.

Table 17.5.2-39: PRACK (I-CSCF2b to P-CSCF2)

```

PRACK sip:sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
    icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: user2_public1@home2.net
From:
To:
Call-ID:
Cseq:
Rack:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

40. PRACK (P-CSCF2 to UE2) - see example in table 17.5.2-40

P-CSCF2 and forwards the PRACK request to the UE2.

Table 17.5.2-40: PRACK (P-CSCF2 to UE2)

```

PRACK sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token3

```

```

From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

```

```

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

41. 200 OK (UE2 to P-CSCF2) - see example in table 17.5.2-41

UE2 acknowledges the PRACK request with a 200 OK response.

Table 17.5.2-41: 200 OK (UE2 to P-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token3
From:
To:
Call-ID:
CSeq: 133 Prack
Content-Length: 0

```

42. Resource Reservation

After determining the final set of media streams for this additional media, UE2 initiates the reservation procedures for the additional resources needed for this new media.

43. 200 OK (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-43

P-CSCF2 forwards the 200 OK response to I-CSCF2b.

Table 17.5.2-43: 200 OK (P-CSCF2 to I-CSCF2b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

44. 200 OK (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-44

I-CSCF2b forwards the 200 OK response to S-CSCF2.

Table 17.5.2-44: 200 OK (I-CSCF2b to S-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP

```

```

scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

45. 200 OK (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-45

S-CSCF2 forwards the 200 OK response to I-CSCF2a.

Table 17.5.2-45: 200 OK (S-CSCF2 to I-CSCF2a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

46. 200 OK (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-46

I-CSCF2a forwards the 200 OK response to I-CSCF1b.

Table 17.5.2-46: 200 OK (I-CSCF2a to I-CSCF1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

47. 200 OK (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-47

S-CSCF forwards the 200 OK response to S-CSCF1.

Table 17.5.2-47: 200 OK (I-CSCF1b to S-CSCF1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

48. 200 OK (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-48

S-CSCF1 forwards the 200 OK response to I-CSCF1a.

Table 17.5.2-48: 200 OK (S-CSCF1 to I-CSCF1a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:

```

```
CSeq:
Content-Length: 0
```

49. 200 OK (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-49

I-CSCF1 forwards the 200 OK response to P-CSCF1.

Table 17.5.2-49: 200 OK (I-CSCF1a to P-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

50. 200 OK (P-CSCF1 to UE1) - see example in table 17.5.2-50

P-CSCF1 forwards the 200 OK response to the originator.

Table 17.5.2-50: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

51. Resource Reservation

After determining the final set of media streams for this additional media, UE1 initiates the reservation procedures for the additional resources needed for this new media.

52. COMET (UE1 to P-CSCF1) - see example in table 17.5.2-52

After determining the final set of media streams for this additional media, UE1 initiates the reservation procedures for the additional resources needed for this new media.

Table 17.5.2-52: COMET (UE1 to P-CSCF1)

```
COMET sip: [5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222;time=36123E5B;seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 134 COMET
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=907166275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendonly
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtpmap:31 H261/90000
a=qos:success sendonly
```

53. COMET (P-CSCF1 to I-CSCF1a) - see example in table 17.5.2-53

The COMET request is forwarded through this P-CSCF1 to the I-CSCF1a.

Table 17.5.2-53: COMET (P-CSCF1 to I-CSCF1a)

```

COMET sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:332b23.1@scscf1.home1.net), sip:312a32.1@icscf1_s.home1.net,
      sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

54. COMET (I-CSCF1a to S-CSCF1) - see example in table 17.5.2-54

The COMET request is forwarded through this I-CSCF1a to the S-CSCF1.

Table 17.5.2-54: COMET (I-CSCF1a to S-CSCF1)

```

COMET sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
      sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
      sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

55. COMET (S-CSCF1 to I-CSCF1b) - see example in table 17.5.2-55

S-CSCF1 forwards the COMET request to I-CSCF1b.

Table 17.5.2-55: COMET (S-CSCF1 to I-CSCF1b)

```

COMET sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
    sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

56. COMET (I-CSCF1b to I-CSCF2a) - see example in table 17.5.2-56

I-CSCF1b forwards the COMET request, to I-CSCF2a.

Table 17.5.2-56: COMET (I-CSCF1b to I-CSCF2a)

```

COMET sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

57. COMET (I-CSCF2a to S-CSCF2) - see example in table 17.5.2-57

I-CSCF2a forwards the COMET request to S-CSCF2.

Table 17.5.2-57: COMET (I-CSCF2a to S-CSCF2)

```

COMET sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net,
    sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

58. COMET (S-CSCF2 to I-CSCF2b) - see example in table 17.5.2-58

S-CSCF2 forwards the COMET request to I-CSCF2b.

Table 17.5.2-58: COMET (S-CSCF2 to I-CSCF2b)

```

COMET sip:icscf2_p.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

59. COMET (I-CSCF2b to P-CSCF2) - see example in table 17.5.2-59

I-CSCF2b forwards the COMET request to P-CSCF2.

Table 17.5.2-59: COMET (I-CSCF2b to P-CSCF2)

```

COMET sip:sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
    icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: user2_public1@home2.net
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

60. COMET (P-CSCF2 to UE2) - see example in table 17.5.2-60

P-CSCF2 determines the UE address from the value of the Request-URI and forwards the COMET request to the UE2.

Table 17.5.2-60: COMET (P-CSCF2 to UE2)

```

COMET sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token4
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

61. 200 OK (UE2 to P-CSCF2) - see example in table 17.5.2-61

UE2 acknowledges the COMET request with a 200 OK response.

Table 17.5.2-61: 200 OK (UE2 to P-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token4
From:
To:
Call-ID:
CSeq: 134 Comet
Content-Length: 0
```

62. 200 OK (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-62**Table 17.5.2-62: 200 OK (P-CSCF2 to I-CSCF2b)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

63. 200 OK (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-63**Table 17.5.2-63: 200 OK (I-CSCF2b to S-CSCF2)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

64. 200 OK (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-64**Table 17.5.2-64: 200 OK (S-CSCF2 to I-CSCF2a)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

65. 200 OK (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-65**Table 17.5.2-65: 200 OK (I-CSCF2a to I-CSCF1b)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

66. 200 OK (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-66**Table 17.5.2-66: 200 OK (I-CSCF1b to S-CSCF1)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

67. 200 OK (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-67**Table 17.5.2-67: 200 OK (S-CSCF1 to I-CSCF1a)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

68. 200 OK (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-68**Table 17.5.2-68: 200 OK (I-CSCF1a to P-CSCF1)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

69. 200 OK (P-CSCF1 to UE1) - see example in table 17.5.2-69**Table 17.5.2-69: 200 OK (P-CSCF1 to UE1)**

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

70. Alerting

UE2 may optionally delay the session establishment in order to alert the subscriber to the incoming additional media.

71. 180 Ringing (UE2 to P-CSCF2) - see example in table 17.5.2-71

If UE2 performs alerting, it sends a ringing indication to the originator via the signalling path. The response is sent first to P-CSCF2.

Table 17.5.2-71: 180 Ringing (UE2 to P-CSCF2)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
Require: 100rel
From:
To:
Call-ID:
CSeq: 132 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
Rseq: 9023
Content-Length: 0
```

72. 180 Ringing (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-72

Table 17.5.2-72: 180 Ringing (P-CSCF2 to I-CSCF2b)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length:
```

73. 180 Ringing (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-73

Table 17.5.2-73: 180 Ringing (I-CSCF2b to S-CSCF2)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length:
```

74. Service Control

S-CSCF2 performs whatever service control is appropriate for this ringing.

75. 180 Ringing (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-75**Table 17.5.2-75: 180 Ringing (S-CSCF2 to I-CSCF2a)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length:
```

76. 180 Ringing (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-76**Table 17.5.2-76: 180 Ringing (I-CSCF2a to I-CSCF1b)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Rseq:
Contact:
Content-Length:
```

77. 180 Ringing (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-77**Table 17.5.2-77: 180 Ringing (I-CSCF1b to S-CSCF1)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length:
```

78. Service Control

S-CSCF1 performs whatever service control is appropriate for this ringing.

79. 180 Ringing (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-79**Table 17.5.2-79: 180 Ringing (S-CSCF1 to I-CSCF1a)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length: 0
```

80. 180 Ringing (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-80**Table 17.5.2-80: 180 Ringing (I-CSCF1a to P-CSCF1)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Rseq:
Content-Length:
```

81. 180 Ringing (P-CSCF1 to UE1) - see example in table 17.5.2-81**Table 17.5.2-81: 180 Ringing (P-CSCF1 to UE1)**

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Require:
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length:
```

82. Ringback

UE#1 indicates to the originator that the media addition is being delayed due to alerting. Typically this involves playing a ringback sequence.

83. PRACK (UE1 to P-CSCF1) - see example in table 17.5.2-83

The originator sends ACK to the terminator for the Ringing response.

Table 17.5.2-83: PRACK (UE1 to P-CSCF1)

```
PRACK sip: [5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222;time=36123E5B;seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 135 PRACK
Rack: 9023 132 Invite
Content-Length:
```

84. PRACK (P-CSCF1 to I-CSCF1a) - see example in table 17.5.2-84

The PRACK request is forwarded through this I-CSCF1 to the S-CSCF.

Table 17.5.2-84: PRACK (P-CSCF1 to I-CSCF1a)

```
PRACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:332b23.1@scscf1.home1.net), sip:312a32.1@icscf1_s.home1.net,
      sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

85. PRACK (I-CSCF1a to S-CSCF1) - see example in table 17.5.2-85

The PRACK request is forwarded through this I-CSCF1a to the S-CSCF1.

Table 17.5.2-85: PRACK (I-CSCF1a to S-CSCF1)

```
PRACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
      sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
      sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

86. PRACK (S-CSCF1 to I-CSCF1b) - see example in table 17.5.2-86

S-CSCF1 forwards the PRACK request to I-CSCF1b.

Table 17.5.2-86: PRACK (S-CSCF1 to I-CSCF1b)

```
PRACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:
```

87. PRACK (I-CSCF1b to I-CSCF2a) - see example in table 17.5.2-87

I-CSCF1b forwards the PRACK request to I-CSCF2a.

Table 17.5.2-87: PRACK (I-CSCF1b to I-CSCF2a)

```

PRACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

88. PRACK (I-CSCF2a to S-CSCF2) - see example in table 17.5.2-88

I-CSCF2a forwards the PRACK request to S-CSCF2.

Table 17.5.2-88: PRACK (I-CSCF2a to S-CSCF2)

```

PRACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net,
    sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

89. PRACK (S-CSCF2 to I-CSCF2b) - see example in table 17.5.2-89

S-CSCF2 forwards the PRACK request to I-CSCF2b.

Table 17.5.2-89: PRACK (S-CSCF2 to I-CSCF2b)

```

PRACK sip:icscf2_p.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

90. PRACK (I-CSCF2b to P-CSCF2) - see example in table 17.5.2-90

I-CSCF1b forwards the PRACK request to P-CSCF2.

Table 17.5.2-90: PRACK (I-CSCF2b to P-CSCF2)

```

PRACK sip:sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: user2_public1@home2.net
From:
To:
Call-ID:
Cseq:
Rack:
Content-Length:

```

91. PRACK (P-CSCF2 to UE2) - see example in table 17.5.2-91

P-CSCF2 and forwards the PRACK request to the UE2.

Table 17.5.2-91: PRACK (P-CSCF2 to UE2)

```

PRACK sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token6
From:
To:
Call-ID:
Cseq:
Content-Length:

```

92. 200 OK (UE2 to P-CSCF2) - see example in table 17.5.2-92

UE2 acknowledges the PRACK request with a 200 OK response.

Table 17.5.2-92: 200 OK (UE2 to P-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token6
From:
To:
Call-ID:
CSeq: 135 PRACK
Content-Length: 0

```

93. 200 OK (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-93

P-CSCF2 forwards the 200 OK response to I-CSCF2b.

Table 17.5.2-93: 200 OK (P-CSCF2 to I-CSCF2b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:

```

94. 200 OK (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-94

I-CSCF2b forwards the 200 OK response to S-CSCF2.

Table 17.5.2-94: 200 OK (I-CSCF2b to S-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

95. 200 OK (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-95

S-CSCF2 forwards the 200 OK response to I-CSCF2a.

Table 17.5.2-95: 200 OK (S-CSCF2 to I-CSCF2a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

96. 200 OK (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-96

I-CSCF2a forwards the 200 OK response to I-CSCF1b.

Table 17.5.2-96: 200 OK (I-CSCF2a to I-CSCF1b)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

97. 200 OK (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-97

S-CSCF1 forwards the 200 OK response to S-CSCF1.

Table 17.5.2-97: 200 OK (I-CSCF1b to S-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

98. 200 OK (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-98

S-CSCF1 forwards the 200 OK response to I-CSCF1a.

Table 17.5.2-98: 200 OK (S-CSCF1 to I-CSCF1a)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

99. 200 OK (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-99

I-CSCF1 forwards the 200 OK response to P-CSCF1.

Table 17.5.2-99: 200 OK (I-CSCF1a to P-CSCF1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

100. 200 OK (P-CSCF1 to UE1) - see example in table 17.5.2-100

P-CSCF1 forwards the 200 OK response to the originator.

Table 17.5.2-100: 200 OK (P-CSCF1 to UE1)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length:
```

101. 200 OK (UE2 to P-CSCF2) - see example in table 17.5.2-101

UE acknowledges the Invite request with a 200 OK response.

Table 17.5.2-101: 200 OK (UE2 to P-CSCF2)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token2
From:
To:
Call-ID:
CSeq: 132 INVITE
Contact: sip:[5555::eee:fff:aaa:bbb]
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=907166275 0
m=audio 3456 RTP/AVP 97
b=AS:25.4
a=rtptime:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=qos:success sendrecv
m=video 9544 RTP/AVP 31
b=AS:54.6
a=rtptime:31 H261/90000
a=qos:success sendrecv
```

102. Approval of QoS Comment

P-CSCF2 approves the commitment of the QoS resources for this additional media.

103. UE2 can start the new media**104. 200 OK (P-CSCF2 to I-CSCF2b) - see example in table 17.5.2-104**

P-CSCF2 forwards the 200 OK response to I-CSCF2b.

Table 17.5.2-104: 200 OK (P-CSCF2 to I-CSCF2b)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=
```

105. 200 OK (I-CSCF2b to S-CSCF2) - see example in table 17.5.2-105

I-CSCF2b forwards the 200 OK response to S-CSCF2.

Table 17.5.2-105: 200 OK (I-CSCF2b to S-CSCF2)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

106. Service Control

S-CSCF2 performs whatever service control is required for the session completion.

107. 200 OK (S-CSCF2 to I-CSCF2a) - see example in table 17.5.2-107

S-CSCF2 forwards the 200 OK response to I-CSCF2a.

Table 17.5.2-107: 200 OK (S-CSCF2 to I-CSCF2a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

108. 200 OK (I-CSCF2a to I-CSCF1b) - see example in table 17.5.2-108

S-CSCF forwards the 200 OK response to I-CSCF1b.

Table 17.5.2-108: 200 OK (I-CSCF2a to I-CSCF1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

109. 200 OK (I-CSCF1b to S-CSCF1) - see example in table 17.5.2-109

I-CSCF1b forwards the 200 OK response to S-CSCF1.

Table 17.5.2-109: 200 OK (I-CSCF2a to I-CSCF1b)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

110. Service Control

S-CSCF1 performs whatever service control is required for the session completion.

111. 200 OK (S-CSCF1 to I-CSCF1a) - see example in table 17.5.2-111

S-CSCF1 forwards the 200 OK response to I-CSCF1a.

Table 17.5.2-111: 200 OK (S-CSCF1 to I-CSCF1a)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

112. 200 OK (I-CSCF1a to P-CSCF1) - see example in table 17.5.2-112

I-CSCF1a forwards the 200 OK response to P-CSCF1.

Table 17.5.2-112: 200 OK (I-CSCF1a to P-CSCF1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

113. Approval of QoS Commit

P-CSCF1 approves the commitment of the QoS resources for this additional media.

114. 200 OK (P-CSCF1 to UE1) - see example in table 17.5.2-114

S-CSCF forwards the 200 OK response to UE1.

Table 17.5.2-114: 200 OK (P-CSCF1 to UE1)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Contact:
Content-Type:
Content-length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
m=
b=
a=
a=

```

115. UE1 can start new media**116. ACK (UE1 to P-CSCF1) - see example in table 17.5.2-116**

UE1 responds to the final response with a SIP ACK request, which is passed to the destination via the signalling path. The request is sent first to P-CSCF1.

Table 17.5.2-116: ACK (UE1 to P-CSCF1)

```

ACK sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net;time=36123E5B;seq=72))@localhost>;tag=171828
To: sip:B36(SHA-1(+1-212-555-2222;time=36123E5B;seq=73))@localhost;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 132 ACK
Content-Length: (...)

```

117. ACK (P-CSCF1 to I-CSCF1a) - see example in table 17.5.2-117**Table 17.5.2-117: ACK (P-CSCF1 to I-CSCF1a)**

```

ACK sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:332b23.1@scscf1.home1.net), sip:312a32.1@icscf1_s.home1.net,
      sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
      sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-length: 0

```


118. ACK (I-CSCF1a to S-CSCF1) - see example in table 17.5.2-118

Table 17.5.2-118: ACK (I-CSCF1a to S-CSCF1)

```

ACK sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:312a32.1@icscf1_s.home1.net, sip:871y12.1@icscf2_s.home2.net,
    sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

119. ACK (S-CSCF1 to I-CSCF1b) - see example in table 17.5.2-119

Table 17.5.2-119: ACK (S-CSCF1 to I-CSCF1b)

```

ACK sip:icscf1_s.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:871y12.1@icscf2_s.home2.net, sip:token(sip:764z87.1@scscf2.home2.net),
    sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

120. ACK (I-CSCF1b to I-CSCF2a) - see example in table 17.5.2-120

Table 17.5.2-120: ACK (I-CSCF1b to I-CSCF2a)

```

ACK sip:icscf2_s.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:token(sip:764z87.1@scscf2.home2.net), sip:556u87.1@icscf2_p.home2.net,
    sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

121. ACK (I-CSCF2a to S-CSCF2) - see example in table 17.5.2-121

Table 17.5.2-121: ACK (I-CSCF2a to S-CSCF2)

```

ACK sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1,
    SIP/2.0/UDP token(SIP/2.0/UDP scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP
    icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Route: sip:556u87.1@icscf2_p.home2.net, sip:361k21.1@pcscf2.visited2.net,
    sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

122. ACK (S-CSCF2 to I-CSCF2b) - see example in table 17.5.2-122

Table 17.5.2-122: ACK (S-CSCF2 to I-CSCF2b)

```

ACK sip:icscf2_p.home2.net
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1,
    SIP/2.0/UDP icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:361k21.1@pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
From:
To:
Call-ID:
Cseq:
Content-Length:

```

123. ACK (I-CSCF2b to P-CSCF2) - see example in table 17.5.2-123

Table 17.5.2-123: ACK (S-CSCF2 to I-CSCF2b)

```

ACK sip:sip:pcscf2.visited2.net, sip:[5555::eee:fff:aaa:bbb]
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf2.home2.net;branch=764z87.1), SIP/2.0/UDP icscf2_s.home2.net;branch=871y12.1, SIP/2.0/UDP
    icscf1_s.home1.net;branch=312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
    scscf1.home1.net;branch=332b23.1), SIP/2.0/UDP icscf1_p.home1.net;branch=351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: user2_public1@home2.net
From:
To:
Call-ID:
Cseq:
Content-Length:

```

124. ACK (P-CSCF2 to UE2) - see example in table 17.5.2-124

Table 17.5.2-124: ACK (P-CSCF2 to UE2)

```

ACK sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token3
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

```

17.6 Error handling: Session Initiation

Editor's Note: Tdoc N1-010484 outlines a number of exception conditions, which should be expanded in future contributions and included under this subclause.

18 Signalling flows for session release (hiding)

18.1 Introduction

See subclause 8.1.

18.2 Mobile terminal initiated session release

Figure 18.2-1 shows a mobile terminal initiated IM CN subsystem application (SIP) session release. It is assumed that the session is active and that the bearer was established directly between the two visited networks (the visited networks could be the home network in either or both cases).

NOTE 1: For the purposes of the description of the I-CSCF in figure 18.2-1 and in the associated text, it is assumed that the party that established the session initiated the clearing. For clearing in the reverse direction, there is a slight change in the optionality of the I-CSCFs between the S-CSCFs. This is as described for session establishment.

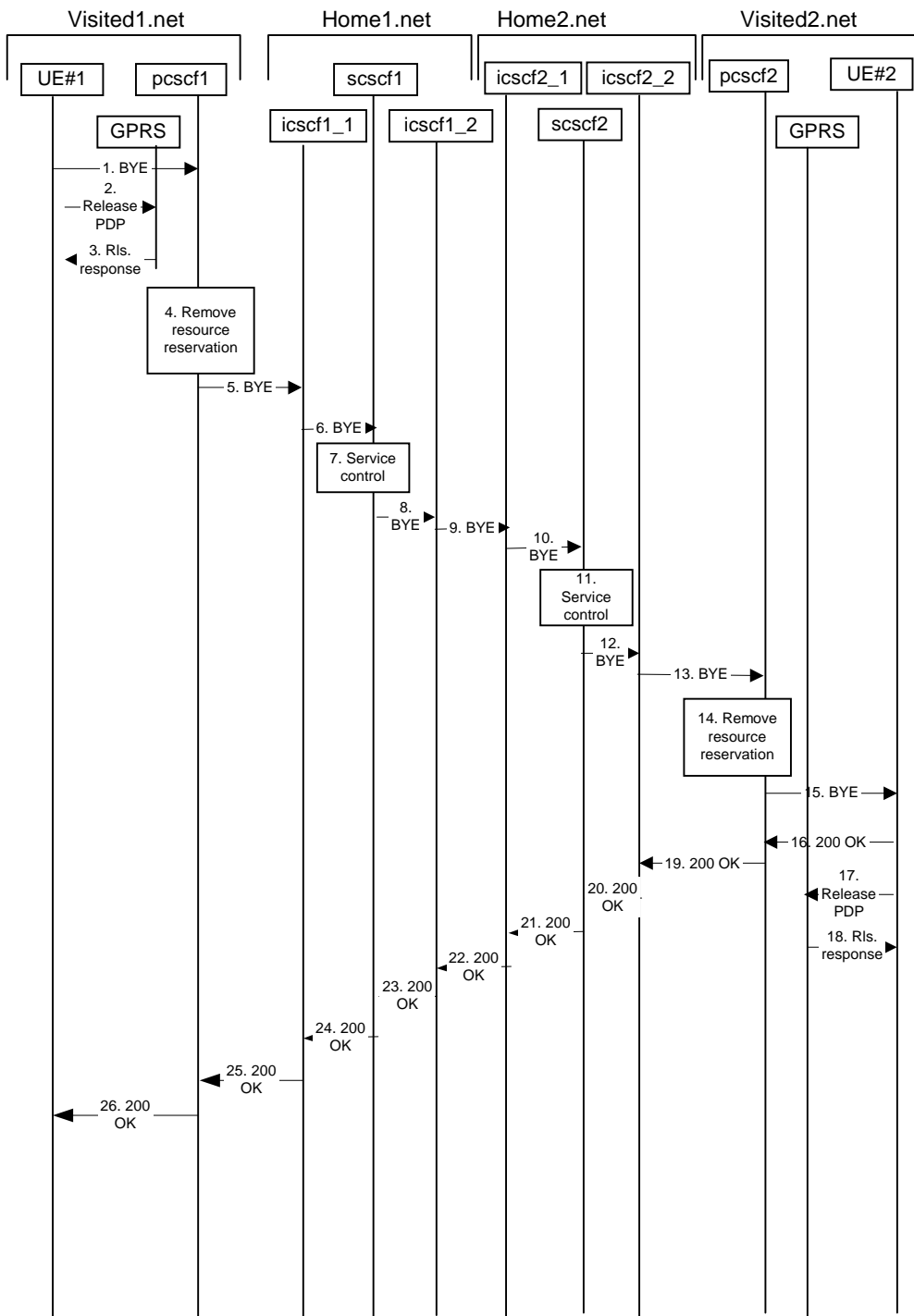


Figure 18.2-1: Mobile initiated session release

1. SIP BYE (UE to P-CSCF) - see example in table 18.2-1

One mobile party hangs up, which generates a SIP BYE request from the UE to the P-CSCF.

Table 18.2-1: SIP BYE (UE to P-CSCF)

```

BYE sip:token10@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From: "Alien Blaster" <sip:B36(SHA-1(user1_public1@home1.net; time=36123E5B; seq=72))@localhost>
To: <sip:B36(SHA-1(555-2222; time=36123E5B; seq=73))@localhost>;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 153 BYE
Contact: sip:[5555::aaa:bbb:ccc:ddd]
Content-Length: 0

```

The request-URI takes the value of the Contact header of the previously received response.

The Via header and the contact header take the value of either the IP address or the FQDN of the originating UE.

The example contents of the From header, the To header and Call-ID header are used to identify the session being cleared, and therefore are identical to those of the previously received response for that session, so that they include any tag parameters.

The content of the Cseq header must have a higher sequence number than the previous transaction. Here it is assumed that a Cseq value no greater than 152 has been previously used.

2. Release PDP

Steps 2 and 3 may take place before or after Step 1 and in parallel with Step 4. The UE initiates the release of the bearer PDP context. The GPRS subsystem releases the PDP context. The IP network resources that had been reserved for the message receive path to the mobile for this session are now released. This is initiated from the GGSN. If RSVP was used to allocated resources, then the appropriate release messages for that protocol would be invoked here.

3. Rls. Response

The GPRS subsystem responds to the UE.

4. Remove resource reservation

The P-CSCF removes the authorization for resources that had previously been issued for this endpoint for this session. This step will also result in a release indication to the GPRS subsystem to confirm that the IP bearers associated with the session have been deleted.

5. SIP BYE (P-CSCF to I-CSCF) - see example in table 18.2-5

The P-CSCF sends a SIP BYE request to the I-CSCF (THIG) hiding the S-CSCF of the releasing party.

Table 18.2-5: SIP BYE (P-CSCF to I-CSCF)

```

BYE sip:icscf1a.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:Token(scscf1.home1.net, sip:764z87.1@scscf2.home2.net),
      sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
From:
To:
Call-ID:
CSeq:
Contact: sip:%5b5555%3a%3aaaa%3abbb%3accc%3add%5d@pcscf1.visited1.net
Content-Length: 0

```

6. SIP BYE (I-CSCF to S-CSCF) - see example in table 18.2-6

The I-CSCF (THIG) sends a SIP BYE request to the S-CSCF of the releasing party.

Table 18.2-6: SIP BYE (I-CSCF to S-CSCF)

```

BYE sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:351g45.1@icscf1_p.home1.net
Route: sip:764z87.1@scscf2.home2.net, sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:icscf1a.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

7. Service control

The S-CSCF performs whatever service control procedures are appropriate for this ending session.

8. SIP BYE (S-CSCF to I-CSCF) - see example in table 18.2-8

The SIP BYE request is sent from the S-CSCF to the I-CSCF (THIG).

Table 18.2-8: SIP BYE (S-CSCF to I-CSCF)

```

BYE sip:icscf1b.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Route: sip:icscf2b.home2.net, sip:Token(scscf2.home2.net),
    sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

9. SIP BYE (I-CSCF to I-CSCF) - see example in table 18.2-9

The SIP BYE request is sent from the I-CSCF (THIG) to the I-CSCF of the network of the other party.

Table 18.2-9: SIP BYE (I-CSCF to I-CSCF)

```

BYE sip:icscf2b.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Route: sip:Token(scscf2.home2.net), sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:icscf1b.home1.net, sip:Token(scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

10. SIP BYE (I-CSCF to S-CSCF) - see example in table 18.2-10

The SIP BYE request is forwarded from the I-CSCF that was used to determine the location of S-CSCF of the other party.

Table 18.2-10: SIP BYE (I-CSCF to S-CSCF)

```

BYE sip:scscf2.home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2b.home2.net, SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP
      Token(scscf1.home1.net, SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP
      pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:icscf2b.home2.net, sip:icscf1b.home1.net, sip:Token(scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

11. Service control

The S-CSCF performs whatever service control procedures are appropriate for this ending session.

12. SIP BYE (S-CSCF to I-CSCF) - see example in table 18.2-12

The SIP BYE request is forwarded to a I-CSCF (THIG).

Table 18.2-12: SIP BYE (S-CSCF to I-CSCF)

```

BYE sip:icscf2a.home2.net SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2b.home2.net, SIP/2.0/UDP
      icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP icscf1a.home1.net,
      SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Route: sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

13. SIP BYE (I-CSCF to P-CSCF) - see example in table 18.2-13

The I-CSCF (THIG) forwards the SIP BYE request to the P-CSCF.

Table 18.2-13: SIP BYE (I-CSCF to P-CSCF)

```

BYE sip:%5b5555%3a%3aeee%3afff%3aaaa%3abbb%5d@pcscf2.visited2.net SIP/2.0
Via: SIP/2.0/UDP icscf2a.home2.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
      icscf2b.home2.net, SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
      SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
      [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:icscf2a.home2.net, sip:Token(scscf2.home2.net, sip:332b23.1@scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Contact:
Content-Length: 0

```

14. Remove resource reservation

The P-CSCF removes the authorisation for resources that had previously been issued for this endpoint for this session. This step also results in a release indication to the GPRS subsystem to confirm that the IP bearers associated with the UE#2 session have been deleted.

15. SIP BYE (P-CSCF to UE) - see example in table 18.2-15

The P-CSCF forwards the SIP BYE request on to the UE.

Table 18.2-15: SIP BYE (P-CSCF to UE)

```

BYE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token25
From:
To:
Call-ID:
CSeq:
Contact: token26@pcscf2.visited2.net
Content-Length: 0

```

16. 200 OK (UE to P-CSCF) - see example in table 18.2-16

The mobile responds with a 200 OK response, which is sent back to the P-CSCF.

Table 18.2-16: 200 OK (UE to P-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=361k21.1;branch=token26
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

17. Release PDP

Steps 14 and 15 may be done in parallel with step 13. The Mobile initiates the release of the bearer PDP context.

18. RIs response

The GPRS subsystem releases the PDP context. The IP network resources that had were reserved for the message receive path to the mobile for this session are now released. This is initiated from the GGSN. If RSVP was used to allocated resources, then the appropriate release messages for that protocol would invoked here.

19. 200 OK (P-CSCF to I-CSCF) - see example in table 18.2-19

The P-CSCF sends a 200 OK response to the I-CSCF (THIG).

Table 18.2-19: 200 OK (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2a.home2.net, SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP
icscf2b.home2.net, SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net,
SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd])
Record-Route: sip:icscf2a.home2.net, sip:Token(scscf2.home2.net, sip:332b23.1@scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

20. 200 OK (I-CSCF to S-CSCF) - see example in table 18.2-20

The I-CSCF (THIG) sends a 200 OK response to the S-CSCF.

Table 18.2-20: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf2.home2.net;branch=764z87.1, SIP/2.0/UDP icscf2b.home2.net, SIP/2.0/UDP
    icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP icscf1a.home1.net,
    SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:icscf2a.home2.net, sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

21. 200 OK (S-CSCF to I-CSCF) - see example in table 18.2-21

The S-CSCF of the other party forwards the 200 OK response to its selecting I-CSCF.

Table 18.2-21: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf2b.home2.net, SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP
    Token(scscf1.home1.net, SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:icscf2b.home2.net, sip:icscf1b.home1.net, sip:Token(scscf1.home1.net)
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

22. 200 OK (I-CSCF to I-CSCF) - see example in table 18.2-22

The selecting I-CSCF forwards the 200 OK response to the I-CSCF (THIG).

Table 18.2-22: 200 OK (I-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1b.home1.net, SIP/2.0/UDP Token(scscf1.home1.net, SIP/2.0/UDP
    icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd])
Record-Route: sip:Token(icscf1b.home1.net), sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

23. 200 OK (I-CSCF to S-CSCF) - see example in table 18.2-23

The I-CSCF (THIG) forwards the 200 OK response to the S-CSCF.

Table 18.2-23: 200 OK (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=332b23.1, SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP
    pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf2.home2.net), sip:icscf.home2.net, sip:icscf.home1.net,
    sip:332b23.1@scscf1.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

24. 200 OK (S-CSCF to I-CSCF) - see example in table 18.2-24

The S-CSCF of the releasing party forwards the 200 OK response to the I-CSCF (THIG).

Table 18.2-24: 200 OK (S-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1a.home1.net, SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd]
Record-Route: sip:764z87.1@scscf2.home2.net, sip:332b23.1@scscf1.home1.net, sip:icscf1a.home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

25. 200 OK (I-CSCF to P-CSCF) - see example in table 18.2-25

The I-CSCF (THIG) forwards the 200 OK response to the P-CSCF of the releasing party.

Table 18.2-25: 200 OK (I-CSCF to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=240f34.1, SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
Record-Route: sip:Token(scscf1.home1.net, sip:764z87.1@scscf2.home2.net), sip:icscf2.home2.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

26. SIP OK (P-CSCF to UE) - see example in table 18.2-26

The P-CSCF of the releasing party forwards the 200 OK response to the UE.

Table 18.2-26: SIP OK (P-CSCF to UE)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

18.3 PSTN initiated session release (not provided)

An example of this flow is not shown in the present document.

18.4 Error handling: session release (not provided)

An example of this flow is not shown in the present document.

19 Network initiated procedures (hiding) (not provided)

An example of this flow is not shown in the present document.

20 Procedures to enable enhanced multimedia services (hiding) (not provided)

An example of this procedure is not shown in the present document.

Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
19/10/00		N1-001108			Version 0.0.1 Presented to CN1 SIP ad-hoc #1		0.0.1
19/10/00		N1-001114			Version 0.0.2 Revisions identified by CN1 SIP ad-hoc #1	0.0.1	0.0.2
08/11/00		N1-001189			Version 0.0.3 Changes to new 3GPP template and styles	0.0.2	0.0.3
22/11/00		N1-001378			Version 0.1.0 Inclusion of baseline material from CN #14 REGISTER and INVITE flows	0.0.3	0.1.0
29/11/00					Version 0.2.0 Material added to UE generated REGISTER request	0.1.0	0.2.0
21/02/01		N1-010371			Version 0.3.0 Inclusion of contributions and updates from CN1/SA2 SIP#3. Tdocs include N1-010247, N1-010248, N1-010255, N1-010258, N1-010259, N1-010263, N1-010265, N1-010267, N1-010274.	0.2.0	0.3.0
09/03/01		N1-010505			Version 0.4.0 Inclusion of contributions and updates from CN1#16. Tdocs include N1-010352 (NJ-010123), N1-010353 (NJ-010124), N1-010416 (NJ-010142), N1-010425 (NJ-010143), N1-010483, N1-010484.	0.3.0	0.4.0
17/04/01		N1-010756			Version 0.5.0 Inclusion of contributions and updates from CN1/SA2 SIP#4. Tdocs include N1-010573, N1-010552, N1-010531, N1-010572, N1-010571, N1-010570, N1-010569, N1-010529, N1-010515, N1-010514, N1-010513, N1-010511, N1-010510, N1-010580, N1-010564, N1-010563, N1-010562, N1-010549, N1-010538	0.4.0	0.5.0
21/05/01		None			Version 1.0.0 Inclusion of contributions and updates from CN1#17. Version for presentation for Information at CN#12 Tdocs include N1-010702, N1-010703, N1-010705, N1-010706, N1-010707, N1-010747, N1-010849, N1-010874, N1-010875, N1-010883, N1-010884, N1-010885, N1-010891, N1-010895, N1-010898, N1-010900	0.5.0	1.0.0
22/06/01		N1-010944			Version 1.1.0. Completion of two contributions (i.e. N1-010849, N1-010898) from CN1#17, plus numerous formatting changes.	1.0.0	1.1.0
18/07/01		N1-011230			Version 1.2.0. Inclusion of contributions and updates from CN1#18, plus numerous formatting changes. Tdocs include: N1-010932, N1-010941, N1-010942 (partial), N1-010943, N1-010945, N1-010946, N1-010947, N1-010952, N1-010953, N1-010964, N1-010969, N1-010970, N1-010975, N1-010991, N1-010994, N1-010995, N1-011024, N1-011030, N1-011031, N1-011036, N1-011038, N1-011047	1.1.0	1.2.0
11/09/01		N1-011363			Version 1.3.0. Inclusion of all Tdocs (with exception of but N1-011269 - document restructuring) from CN1#19. Tdocs include: N1-011335, N1-011320, N1-011319, N1-011317, N1-011316, N1-011186, N1-011158, N1-011179, N1-011104, N1-011329, N1-011220 (duplicate N1-011180) and N1-011160.	1.2.0	1.3.0
13/09/01		N1-011364			Version 1.4.0. Restructured document in accordance to N1-011269.	1.3.0	1.4.0
05/10/01		N1-011496			Version 1.5.0. Inclusion of all Tdocs from CN1#19bis. Tdocs include: N1-011429, N1-011352, N1-011353, N1-011354, N1-011376, N1-011377, N1-011420, N1-011421, N1-011361, N1-011362, N1-011422, N1-011424, N1-011425	1.4.0	1.5.0
23/10/01		N1-011706			Version 1.6.0. Inclusion of all Tdocs from CN1#20. Tdocs include: N1-011582, N1-011583, N1-011503, N1-011494, N1-011475, N1-011538 (partial), N1-011478, N1-011493, N1-011509, N1-011495, N1-011602, N1-011603, N1-011606, N1-011627, N1-011591, N1-011616	1.5.0	1.6.0
15/11/01		N1-011866			Version 1.7.0. Inclusion of all Tdocs from CN1#20bis. Tdocs include: N1-011654, N1-011752, N1-011753, N1-011703, N1-011655, N1-011711, N1-011667, N1-011671, N1-011764, N1-011708, N1-011656, N1-011775, N1-011776	1.6.0	1.7.0

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
03/12/01		N1-020043			Version 1.8.0. Inclusion of all Tdocs from CN1#21. Tdocs include: N1-012009, N1-012007, N1-012008, N1-011982, N1-012029, N1-012028, N1-012035, N1-012036, N1-012000, N1-012016, N1-012001, N1-011873, N1-011935, N1-012032, N1-011834, N1-012017, N1-011859, N1-011864	1.7.0	1.8.0
20/01/02		N1-020280			Version 1.9.0. Inclusion of all Tdocs from CN1-SIPadhoc. Tdocs include: N1-020131, N1-020019, N1-020020, N1-020143, N1-020045, N1-020121, N1-020054, N1-020134, N1-020162, N1-020125, N1-020075, N1-020091, N1-020158	1.8.0	1.9.0
01/02/02		N1-020535			Version 1.10.0. Inclusion of all Tdocs from CN1#22. Tdocs include: N1-020397, N1-020270, N1-020294, N1-020425, N1-020429, N1-020294, N1-020427	1.9.0	1.10.0
23/02/02		N1-02xxxx			Version 2.0.0. Inclusion of all Tdocs from CN1#22bis. Tdocs include: N1-020530, N1-020536, N1-020622, N1-020621, N1-020520, N1-020631, N1-020657, N1-020630, N1-020513 In addition, this version of specification is proposed for Change Control.	1.10.0	2.0.0
25/02/02		N1-02xxxx			Version 2.0.1. Updated to a) provide clarification that clauses 7.2.4.2, 7.2.4.3, 8.3, 8.4, 17.4.2.2, 17.4.2.3 are not provided b) minor correction to SDP information (error introduced by N1-020536)	2.0.0	2.0.1
02/03/02					Editorial clean-up by ETSI/MCC.	2.0.1	2.0.2