3GPP TSG CN Plenary Meeting #18 **NP-020557**
4th - 6th December 2002. New Orleans, USA.

Source: **TSG CN WG 1**

Title: **CRs to Rel-5 on Work Item IMS-CCR towards 24.228 and 24.229,- PCF/PDF**

Agenda item: **8.1**

Document for: **APPROVAL**

Introduction:

This document contains **2** CRs, **Rel-5** Work Item **"IMS-CCR"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #18 for approval.

Spec	CR #	Rev	CAT	Rel	Tdoc Title	Meeting	TDoc #	C_Version
24.228	093		F	Rel-5	PCF to PDF	N1-27	N1-022386	5.2.0
24.229	289		F	Rel-5	PCF to PDF	N1-27	N1-022387	5.2.0

3GPP TSG-CN1 Meeting #27
Bangkok, Thailand, 11 – 15 November 2002

Tdoc N1-022386

CR-Form-v7

CHANGE REQUEST

⌘ **24.228** **CR** **093** ⌘**rev** **-** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	PCF to PDF change
Source:	⌘	Lucent Technologies
Work item code:	⌘	IMS-CCR
Date:	⌘	11/11/2002
Category:	⌘	**F**
Release:	⌘	*Rel-5*

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Within SA2, tt was agreed to use the Policy Decision Function teminology for compatibiltiy with other access networks (S2-023124Rev2) for all documents from Release 5.
Summary of change:	⌘	Replace the term Policy Control Function with Policy Decision Function throughout the document. In addition, a number of instances of the pcf address exist and these should be made consistent with the addresses used elsewhere in the document, and thus these are now addresses such as pdf1.visited1.net rather than pcf1.xyz.net
Consequences if not approved:	⌘	Confusion between the 3GPP and other architectures.

Clauses affected:	⌘	5.3.1, 5.3.2, 5.3.5, 5.3.6, 7.2.2.1, 7.2.3.1, 7.4.2.1, 7.4.3.1, 7.4.5.1, 7.5.2, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.4.5, 10.4.6, 17.2.2.1, 17.4.2.1, 17.4.5.1, and 17.5.2			
		Y	**N**		
Other specs	⌘	**X**		Other core specifications	⌘ 23.002, 23.207, 23.228, 24.229, 29.207, 29.208
affected:			**X**	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

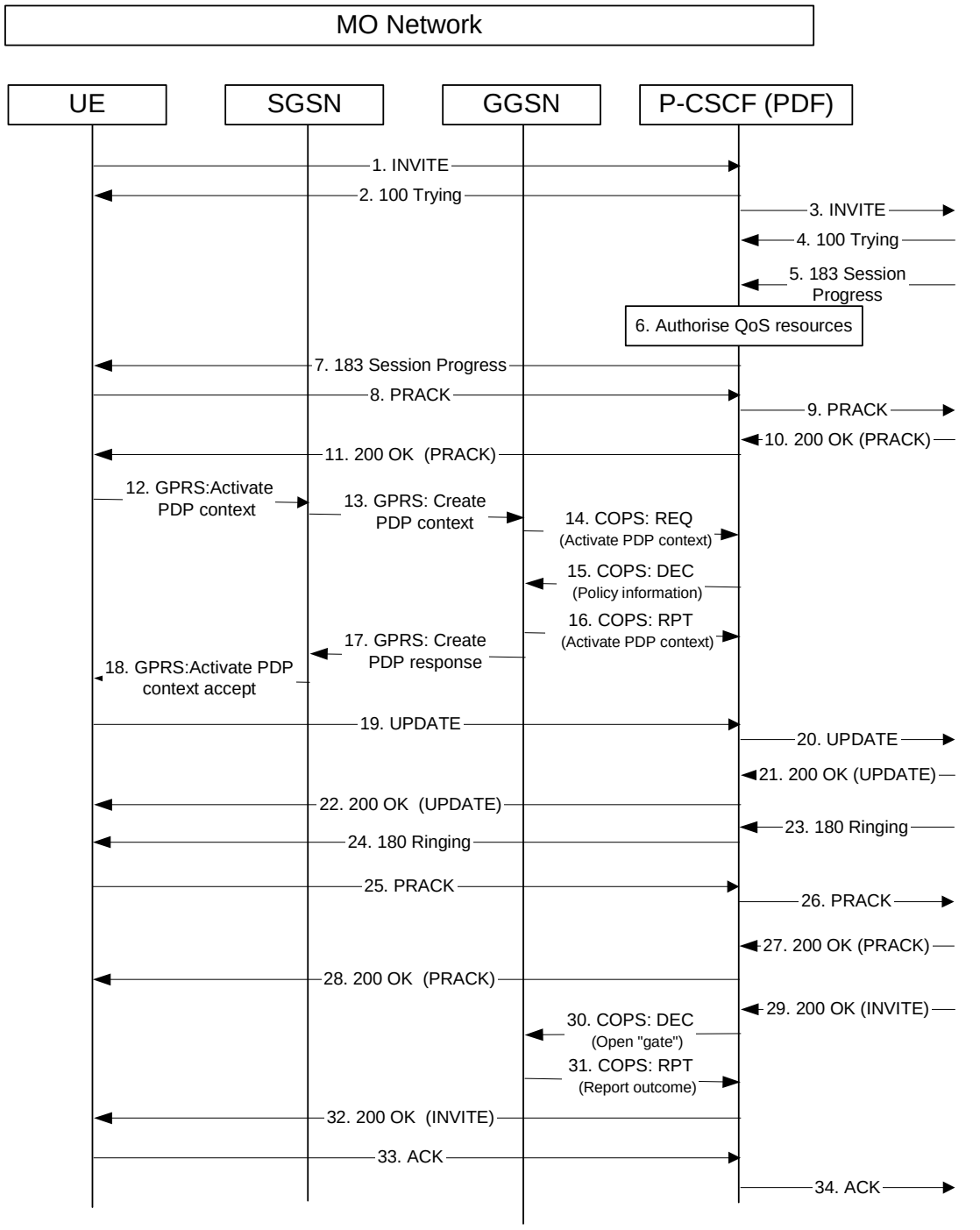
**********First Change**********

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~~PDF. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.


MO Network
UE
SGSN
GGSN
P-CSCF (PDF)
1. INVITE
2. 100 Trying
3. INVITE
4. 100 Trying
5. 183 Session Progress
6. Authorise QoS resources
7. 183 Session Progress
8. PRACK
9. PRACK
10. 200 OK (PRACK)
11. 200 OK (PRACK)
12. GPRS:Activate PDP context
13. GPRS: Create PDP context
14. COPS: REQ (Activate PDP context)
15. COPS: DEC (Policy information)
16. COPS: RPT (Activate PDP context)
17. GPRS: Create PDP response
18. GPRS:Activate PDP context accept
19. UPDATE
20. UPDATE
21. 200 OK (UPDATE)
22. 200 OK (UPDATE)
23. 180 Ringing
24. 180 Ringing
25. PRACK
26. PRACK
27. 200 OK (PRACK)
28. 200 OK (PRACK)
29. 200 OK (INVITE)
30. COPS: DEC (Open "gate")
31. COPS: RPT (Report outcome)
32. 200 OK (INVITE)
33. ACK
34. ACK

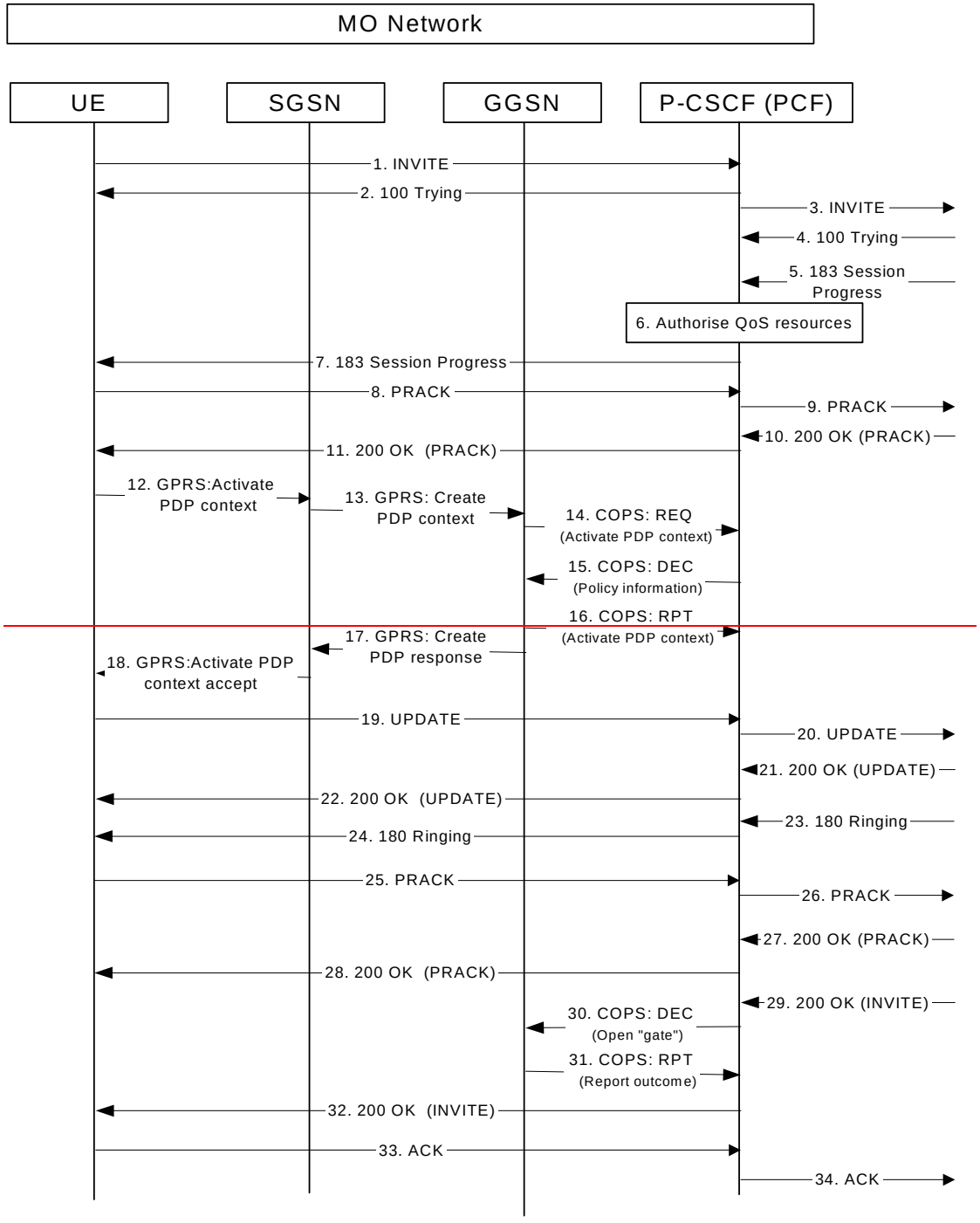


Figure 5.3.1-1: Interaction between SIP/SDP, GPRS and COPS, Mobile originating side

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~~PDF.

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 is 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~~PDF)**

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~~PDF as described in 3GPP TS 29.207. The ~~PCF~~PDF verifies that the media authorisation token information and the associated flow identifier(s) information are as expected.

15. **COPS: DEC (~~PCF~~PDF to GGSN)**

The ~~PCF~~PDF 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~~PDF)**

The GGSN sends a COPS RPT message back to the ~~PCF~~PDF, 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. **UPDATE (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 UPDATE request to the terminating endpoint, via the signalling path established by the INVITE request. The UPDATE 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~~PDF to GGSN)**

When the P-CSCF receives the 200 OK response to the INVITE request, the ~~PCF~~PDF 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.

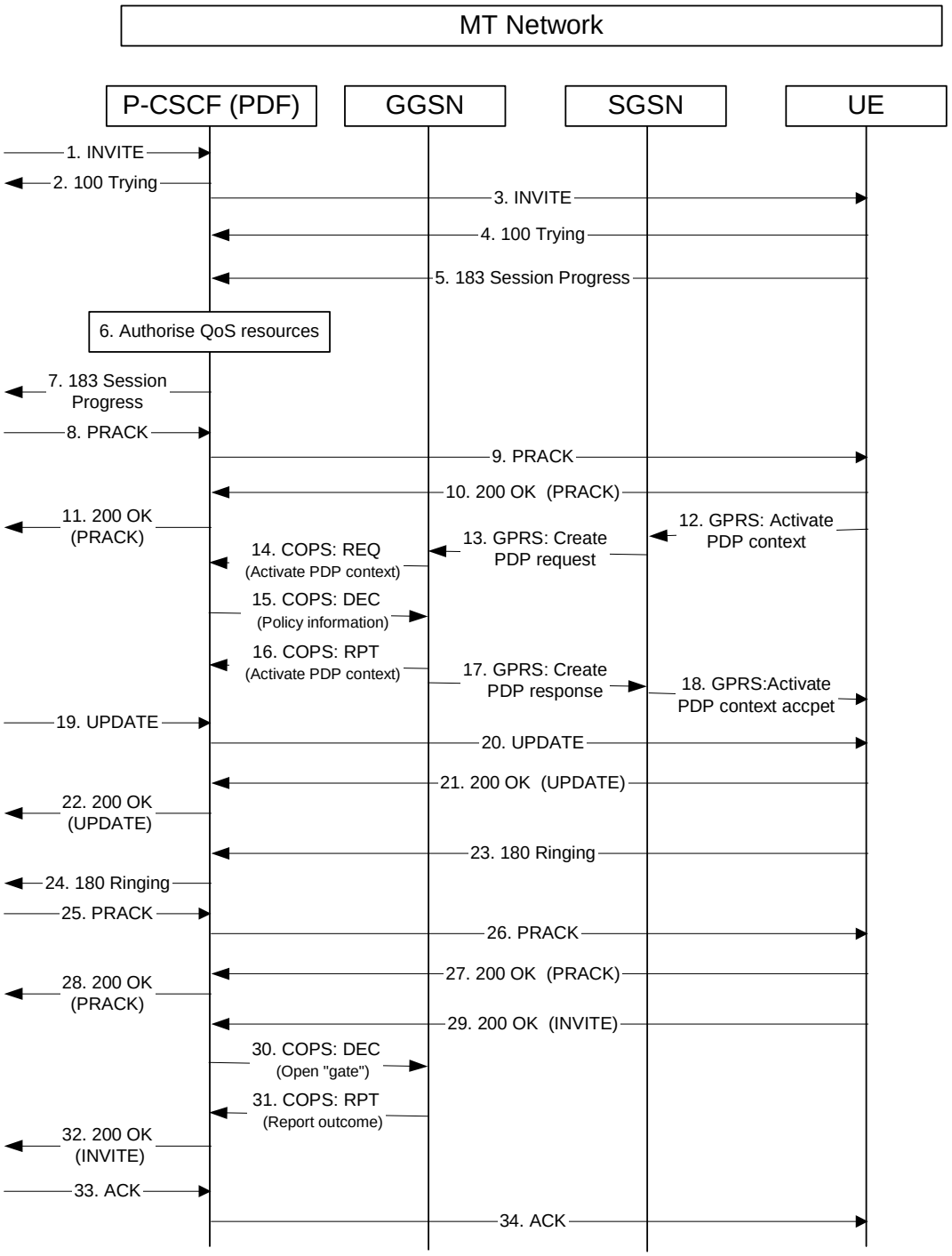
31. **COPS: RPT (GGSN to ~~PCF~~PDF)**

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~~PDF.

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~~PDF. The addition of the GPRS procedures in the access networks to the DiffServ enabled core network guarantees the end-to-end quality of service.


MT Network
P-CSCF (PDF)
GGSN
SGSN
UE
1. INVITE
2. 100 Trying
3. INVITE
4. 100 Trying
5. 183 Session Progress
6. Authorise QoS resources
7. 183 Session Progress
8. PRACK
9. PRACK
10. 200 OK (PRACK)
11. 200 OK (PRACK)
12. GPRS: Activate PDP context
13. GPRS: Create PDP request
14. COPS: REQ (Activate PDP context)
15. COPS: DEC (Policy information)
16. COPS: RPT (Activate PDP context)
17. GPRS: Create PDP response
18. GPRS:Activate PDP context accpet
19. UPDATE
20. UPDATE
21. 200 OK (UPDATE)
22. 200 OK (UPDATE)
23. 180 Ringing
24. 180 Ringing
25. PRACK
26. PRACK
27. 200 OK (PRACK)
28. 200 OK (PRACK)
29. 200 OK (INVITE)
30. COPS: DEC (Open "gate")
31. COPS: RPT (Report outcome)
32. 200 OK (INVITE)
33. ACK
34. ACK

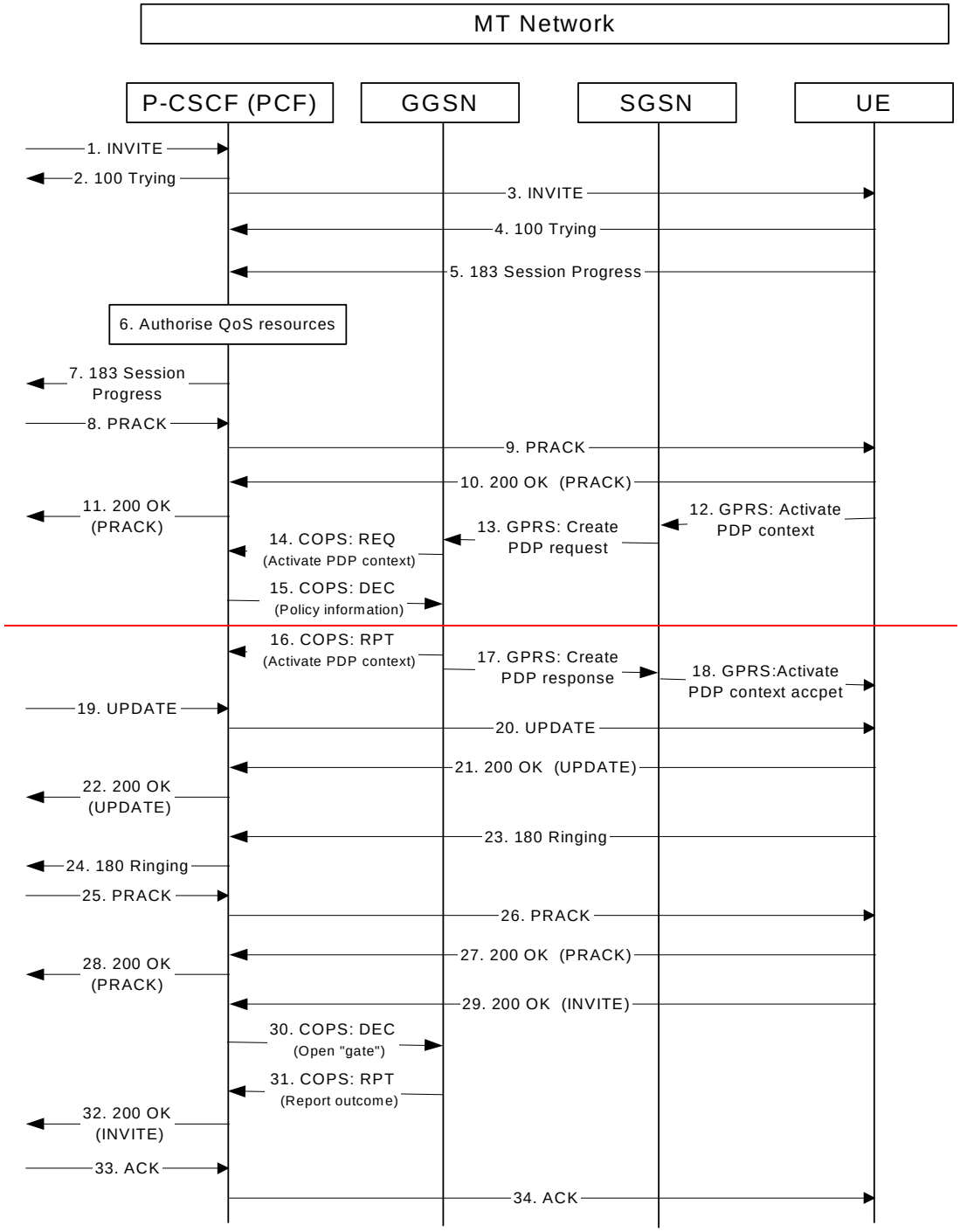


Figure 5.3.2-1 Interaction between SIP/SDP, GPRS and COPS, Mobile terminating side

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~~PDF generates the media authorisation token; the P-CSCF obtains the token from the ~~PCF~~PDF 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 is 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~~PDF)**

   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~~PDF as described in 3GPP TS 29.207. The ~~PCF~~PDF verifies that the media authorisation token information and the associated flow identifier(s) information are as expected.

15. **COPS: DEC (~~PCF~~PDF to GGSN)**

   The ~~PCF~~PDF 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~~PDF)**

   The GGSN sends a COPS RPT message back to the ~~PCF~~PDF, 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 UPDATE request. The UE may now alert the subscriber of an incoming session attempt and send the 180 Ringing provisional response.

30. **COPS: DEC (~~PCF~~PDF to GGSN)**

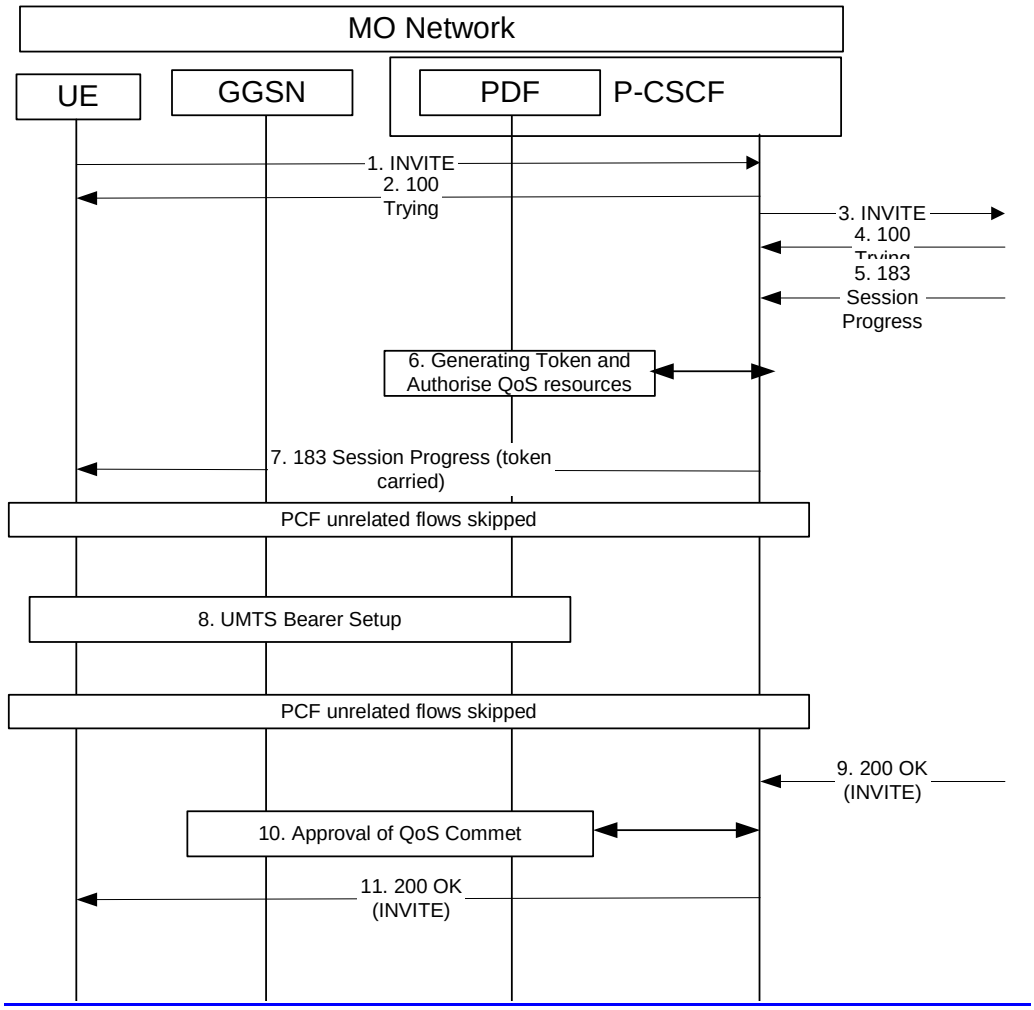
When the P-CSCF receives the 200 OK response to the INVITE request, the ~~PCF~~PDF shall send a COPS DEC message to the GGSN to enable the use of the authorised QoS resources, i.e., to open the 'gate', and allow packet flow in both directions in accordance with the policy decision within the GGSN PEP.

31. **COPS: RPT (GGSN to ~~PCF~~PDF)**

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~~PDF.

**********Next Change**********

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


MO Network
UE
GGSN
PDF
P-CSCF
1. INVITE
2. 100 Trying
3. INVITE
4. 100 Trying
5. 183 Session Progress
6. Generating Token and Authorise QoS resources
7. 183 Session Progress (token carried)
PCF unrelated flows skipped
8. UMTS Bearer Setup
PCF unrelated flows skipped
9. 200 OK (INVITE)
10. Approval of QoS Commet
11. 200 OK (INVITE)

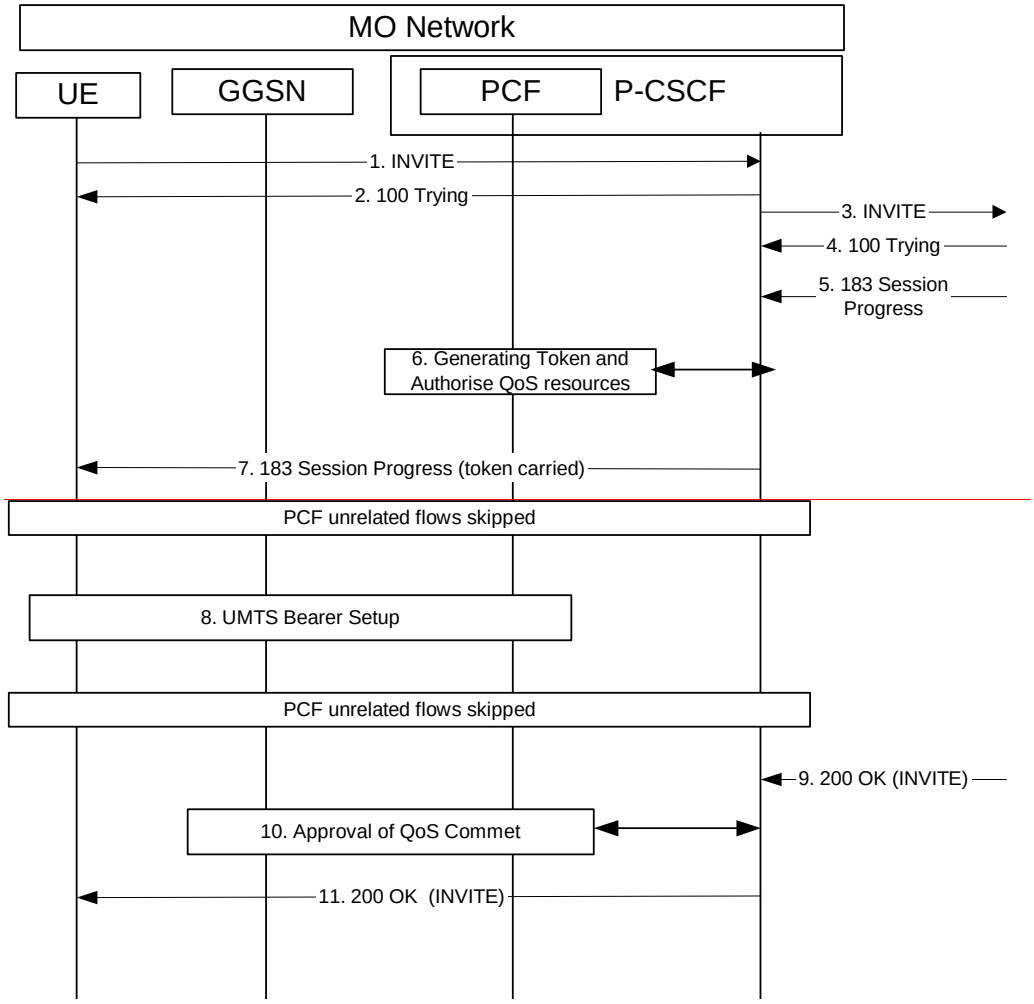


Figure 5.3.5-1: Interaction between P-CSCF and ~~PCF~~PDF, Mobile originating side

6. **~~PCF~~PDF 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~~PDF has sufficient information about this session, such as the end-points, bandwidth requirements, and the characteristics of the media exchange.

The ~~PCF~~PDF 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~~PDF.

The Authorization-Token is generated by the ~~PCF~~PDF 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.

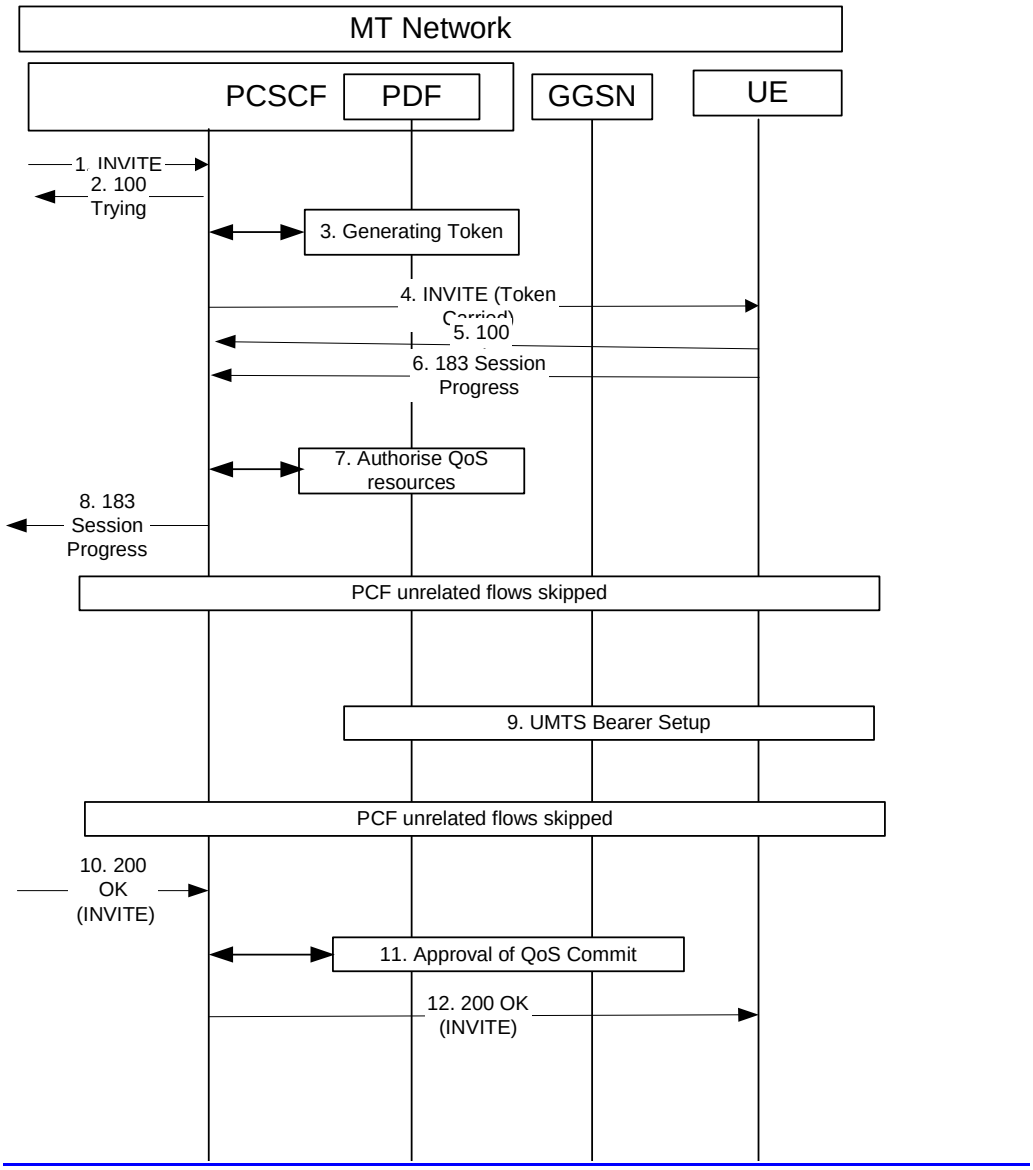
8. **UMTS Bearer Setup**

   UE uses that token to activate PDP Context from GGSN network. The ~~PCF~~PDF 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~~PDF 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


MT Network
PCSCF
PDF
GGSN
UE
1. INVITE
2. 100 Trying
3. Generating Token
4. INVITE (Token Carried)
5. 100
6. 183 Session Progress
7. Authorise QoS resources
8. 183 Session Progress
PCF unrelated flows skipped
9. UMTS Bearer Setup
PCF unrelated flows skipped
10. 200 OK (INVITE)
11. Approval of QoS Commit
12. 200 OK (INVITE)

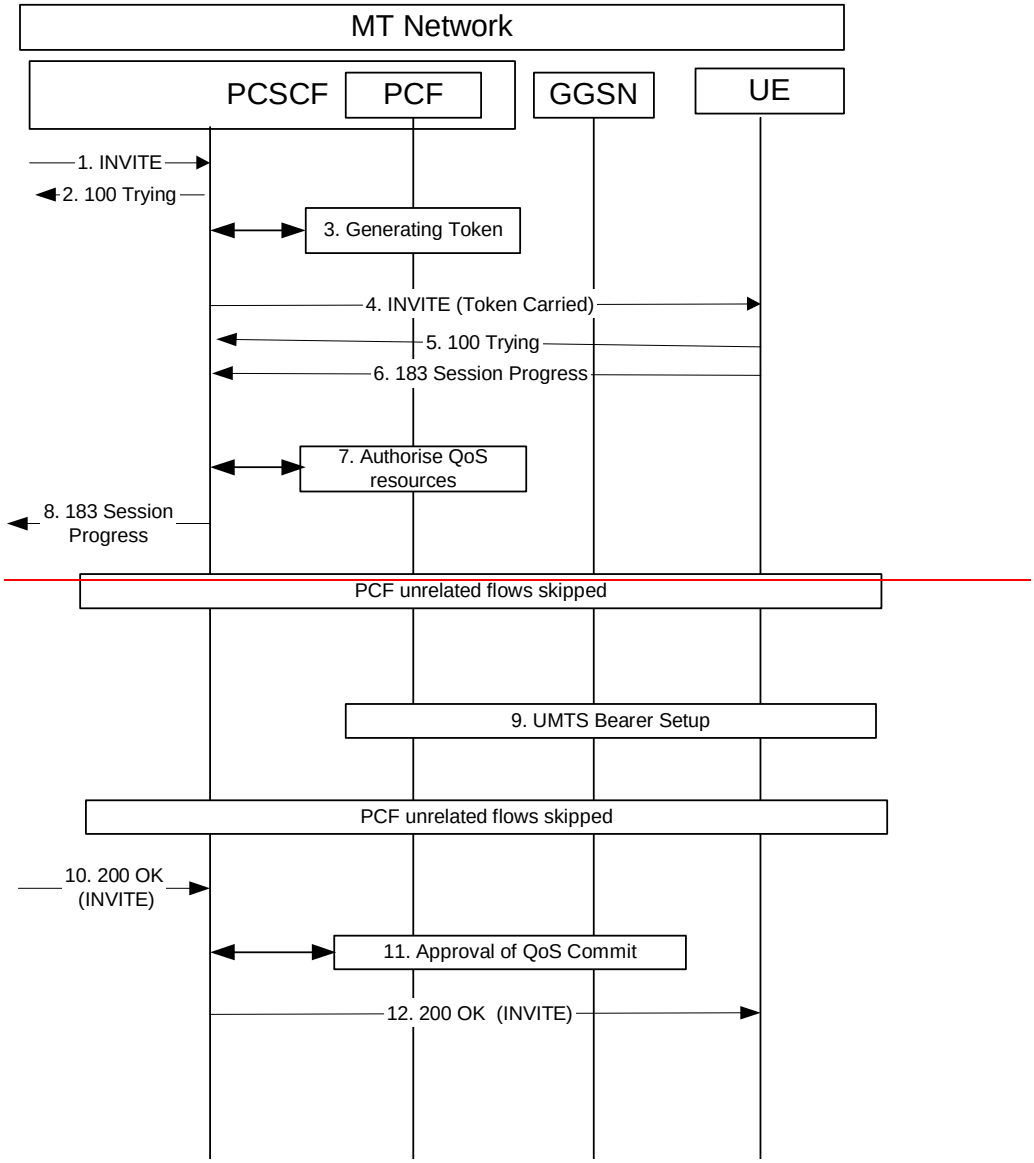


Figure 5.3.6-1: Interaction between P-CSCF and ~~PCF~~PDF, Mobile terminating side

3. **Token Generation**

   Based on the information got from the P-CSCF, the ~~PCF~~PDF generates an authorization token. Since ~~PCF~~PDF 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~~PDF has sufficient information about this session, such as the end-points, bandwidth requirements, and the characteristics of the media exchange.

   The ~~PCF~~PDF 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~~PDF.

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~~PDF 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~~PDF will interact with GGSN network to open the "gate" for the IP bearer.

**********Next Change**********

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.

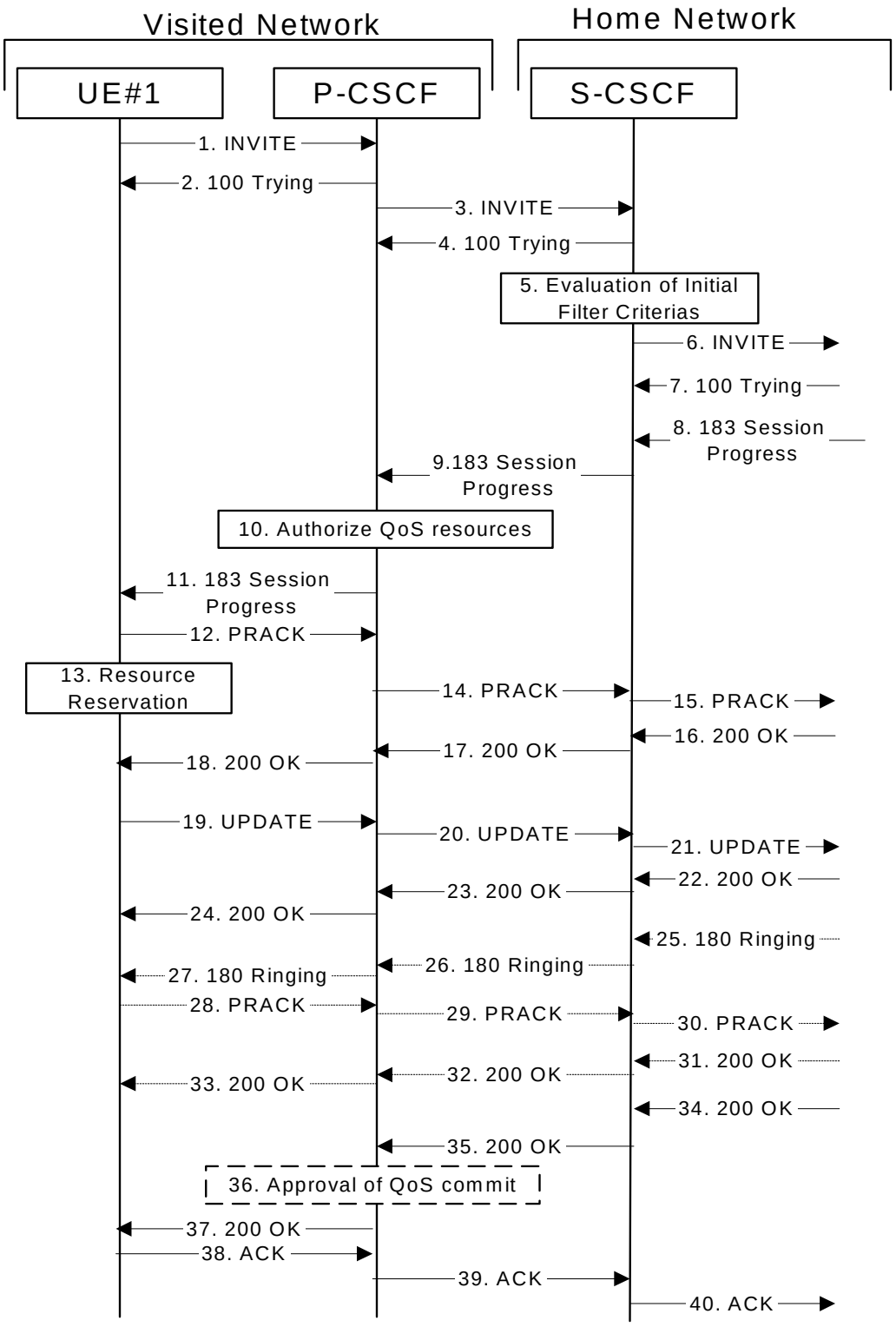


Figure 7.2.2.1-1: MO#1a

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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Request-URI: contains the keyed number from the user.

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

Privacy: the user does not require privacy, therefore the Privacy header is set to the value “none” as specified in draft-ietf-sip-asserted-identity [17] and draft-ietf-sip-privacy-general [13].

P-Asserted-Identity: the user provides a hint about the identity to be used for this session.

P-Access-Network-Info: the UE provides the access-type and access-info, related to the serving access network as specified in sub-clause ' Additional coding rules for P-access-network-info header', in 3GPP TS 24.229 [16].

From: the user does not require privacy, the From header contains the value requested by the user.

Cseq: is a random starting number.

Contact: is a 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: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq(2dest): 127 INVITE
Cseq(2orig): none
Contact(orig): 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];branch=z9hG4bKnashds7
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 a Route 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 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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:scscf1.home1.net;lr
Record-Route: sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
P-Access-Network-Info: 3GPP-UTRAN-TDD; utran-cell-id-3gpp=234151D0FCE11
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 elements from the Path header from registration.

P-Asserted-Identity: The P-CSCF inserts this header based on the user's hint present in the incoming P-Asserted-Identity header.

P-Access-Network-Info: this header contains information from the UE and shall be removed and stored by the S-CSCF.

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 charging or 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: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq(2dest): 127 INVITE
Cseq(2orig): none
Route(2orig): sip:pcscf1.visited1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK240f34.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

5. **Evaluation of initial filter criterias**

   S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

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

   S-CSCF 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.

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

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

```
INVITE sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Route: sip: scscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>, <tel:+1-212-555-1111>
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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.

P-Asserted-Identity: The S-CSCF the corresponding TEL URL to the P-Asserted-Identity header in order that the TEL URL is known to the destination network in case the INVITE is forwarded to a MGCF.

Request-URI: In the case where the Request-URI 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=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:pcscf2.visited2.net;lr, sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr,
   sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Smith" <sip:user2_public1@home2.net>, <tel:+1-212-555-2222>
Privacy: none
From:
To: tel:+1-212-555-2222; tag=314159
Call-ID:
CSeq:
Require: 100rel
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote 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
```

Upon receiving the 183 Session Progress, 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 7.2.2.1-8b.

Table 7.2.2.1-8b: Storage of information at S-CSCF

```
Request-URI: sip:user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:scscf2.home2.net,sip:pcscf2.visited2.net
Route(2orig): sip:pcscf1.visited1.net
Contact(dest): sip:[5555::eee:fff:aaa:bbb]
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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-CSCF to P-CSCF)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:

Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
a=
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: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:scscf1.home1.net, sip:scscf2.home2.net, pcscf2.visited2.net
Contact(dest): sip:[5555::eee:fff:aaa:bbb]
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

10. **Authorize QoS Resources**

P-CSCF authorizes the resources necessary for this session. The approval of QoS commitment either happens at this stage or after 200 OK of INVITE (35) based on operator local policy.

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];branch=z9hG4bKnashds7
P-Asserted-Identity:
Privacy:
P-Media-
   Authorization:00200001001001017064~~3~~6632~~1~~2e~~78797a~~7669736974656432 2e6e6574000c020139425633
   303732~~00~~
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

P-Media-Authorization: a P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pdf2~~1~~.~~xyz~~visited2.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

**********Next Change**********

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.

NOTE: Although S-S#2 flow is assumed, home2.net is used in the Record-Route and Route headers in order to be more generic and clearly identify the originating and terminating nodes. In the S-S#2 scenario home2.net = home1.net.

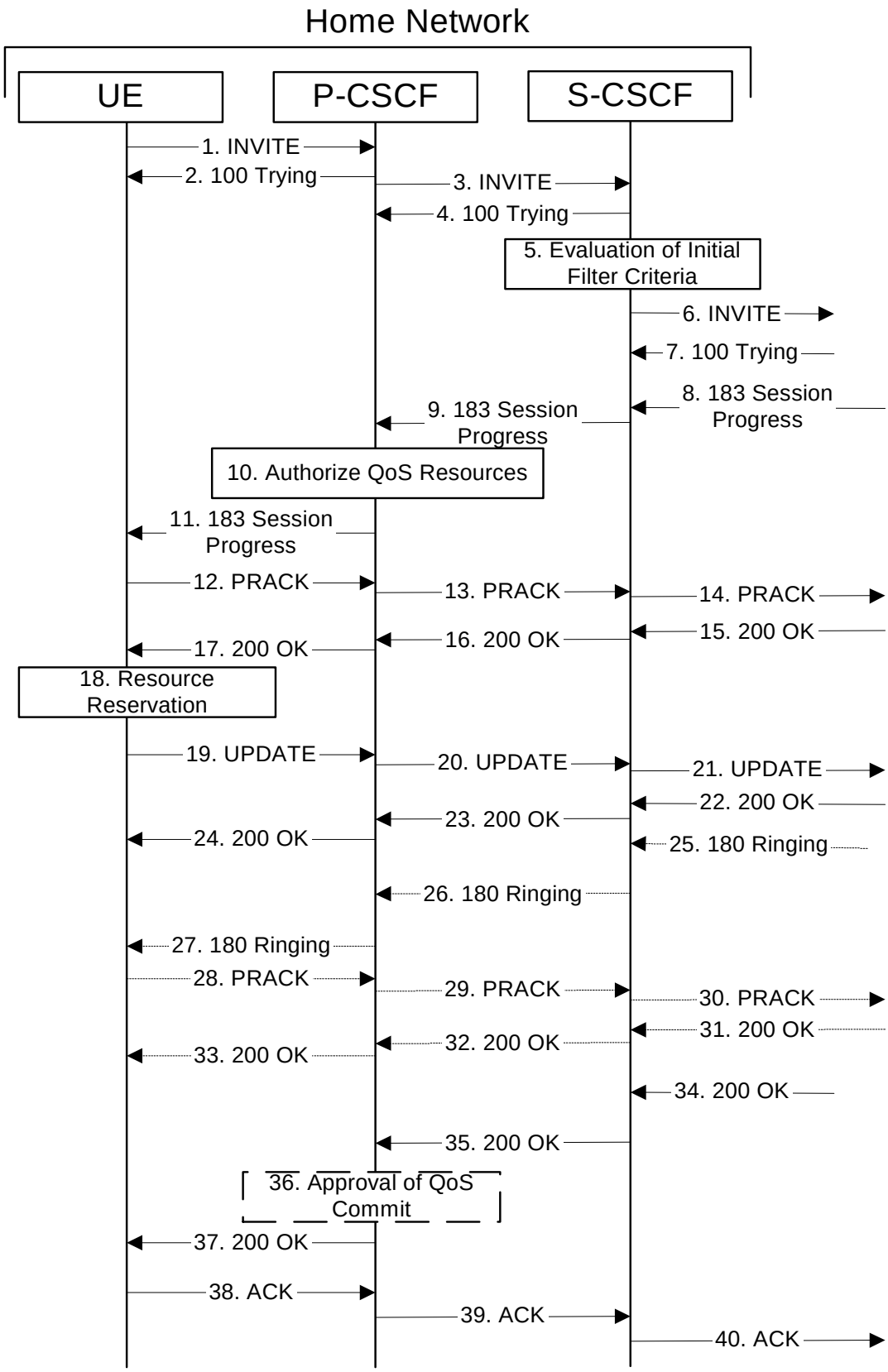


Figure 7.2.3.1-1: MO#2

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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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

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

P-Asserted-Identity: The user provides a hint about the identity to be used for this session.

From:/To:/Call-ID: Follow the recommendations of draft-ietf-sip-privacy[13], even though anonymity is not being requested for this session.

Cseq: A random starting number.

Contact: is a 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 7.2.3.1-1b:

Table 7.2.3.1-1b: Storage of information at P-CSCF

```
Request-URI: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq(2dest): 127 INVITE
Cseq(2orig): none
Contact(orig): 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];branch=z9hG4bKnashds7
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 a Route 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 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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Record-Route: sip:pcscf1.home1.net;lr
Route: sip:scscf1.home1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 elements from the 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).

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: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
Cseq(2orig): none
Route(2orig): sip:pcscf1.home1.net
Contact (orig): 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=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

5. **Evaluation of initial filter criterias**

   S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criterias.

6. **INVITE (MO#2 to S-S) – see example in table 7.2.3.1-6**

   S-CSCF 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.

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

Table 7.2.3.1-6: INVITE (MO#2 to S-S)

```
INVITE sip:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 Request-URI 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=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK332b23.1, SIP/2.0/UDP
     pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:pcscf2.home2.net;lr, sip:scscf2.home2.net;lr, sip:332b23.1@scscf1.home1.net,
   sip:431h23.1@pcscf1.home1.net
P-Asserted-Identity: "John Smith" <tel:+1-212-555-2222>
Privacy: none
From:
To: tel:+1-212-555-2222; tag=314159
Call-ID:
CSeq:
Require: 100rel
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote 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
```

Upon receiving the 183 Session Progress, 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 7.2.3.1-8b.

Table 7.2.3.1-8b: Storage of information at S-CSCF

```
Request-URI: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
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
Contact(dest): sip:[5555::eee:fff:aaa:bbb]
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK431h23.1, SIP/2.0/UDP
     [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
a=
a=
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: tel:+1-212-555-2222
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:scscf1.home1.net, sip:scscf2.home2.net, sip:pcscf2.home2.net
Contact (dest): sip:[5555::eee:fff:aaa:bbb]
Contact (orig): sip:[5555::aaa:bbb:ccc:ddd]
```

10. **Authorize QoS Resources**

P-CSCF authorizes the resources necessary for this session. The approval of QoS commitment either happens at this stage or after 200 OK of INVITE (35) based on operator local policy.

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];branch=z9hG4bKnashds7
P-Media-Authorization:
   00200001001001017064366312e78797a686f6d65312e6e6574000c02013942563330373200
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

P-Media-Authorization: a P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF1~~pcf~~1.~~xyz~~home1.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

**********Next Change**********

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.

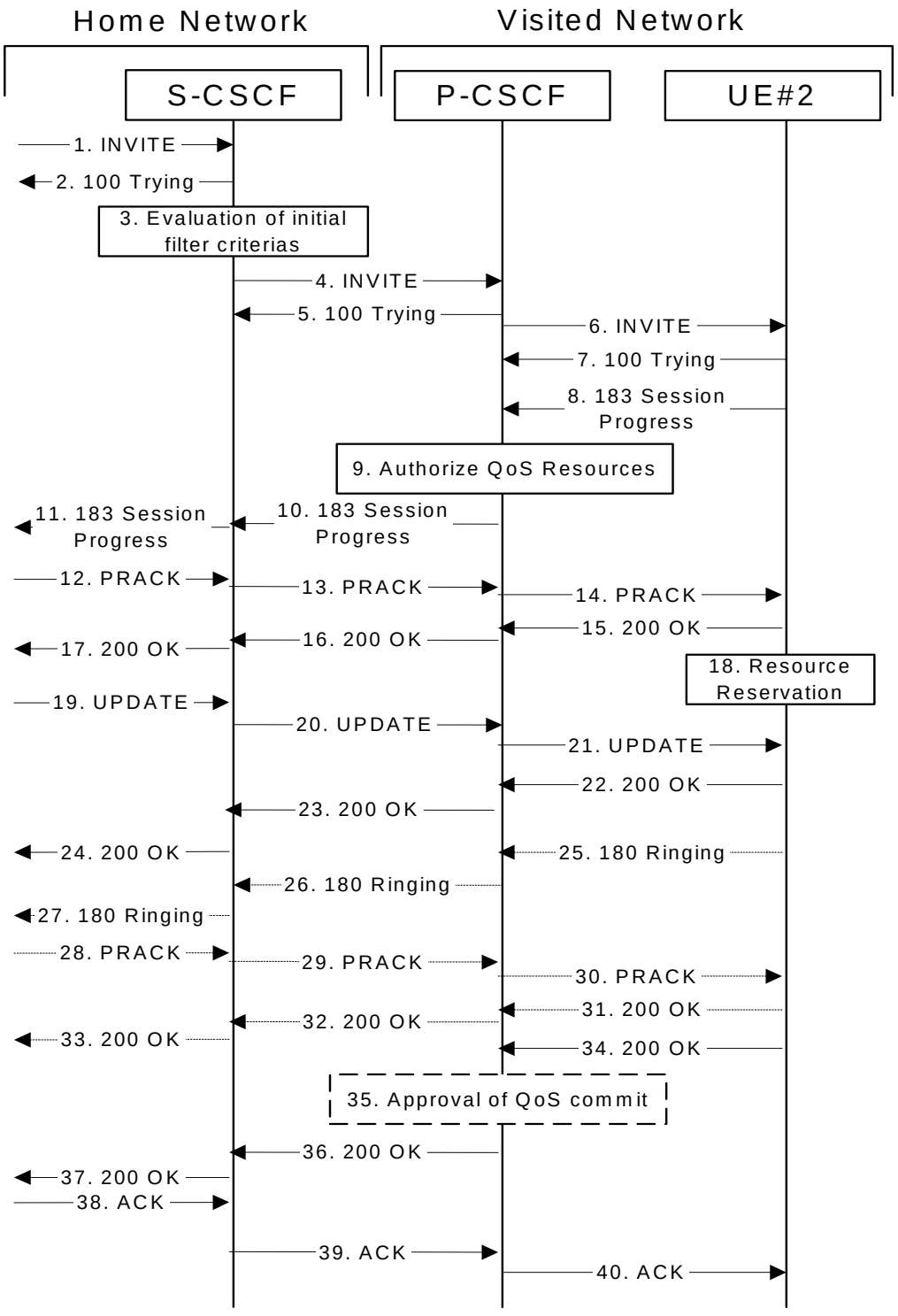


Figure 7.4.2.1-1: MT#1a

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:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:scscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>, <tel:+1-212-555-1111>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: precondition
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 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:user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:scscf1.home1.net, sip:pcscf1.visited1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. **Evaluation of initial filter criterias**

   S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criterias.

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.

   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.

Table 7.4.2.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Route: sip:pcscf2.visited2.net;lr
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.visited1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID: sip:user2_public1@home2.net
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Route: Built from the Path header 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.

P-CSCF saves information from the received INVITE request. 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:+1-212-555-2222@home2.net;user=phone
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:scscf2.home2.net, sip:scscf1.home1.net, sip:pcscf1.visited1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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.

   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.

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=z9hG4bK361k21.1
Max-Forwards: 65
P-Asserted-Identity:
Privacy:
P-Media-Authorization:
   00200001001001017064366312e78797a686f6d653132e6e6574000c02013331533134363231
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pdf1~~2~~.~~xyz~~home1.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.

**********Next Change**********

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.

NOTE: Although S-S#2 flow is assumed, home2.net is used in the Via, Record-Route and Route headers in order to be more generic and clearly identify the originating and terminating nodes. In the S-S#2 scenario home2.net = home1.net.

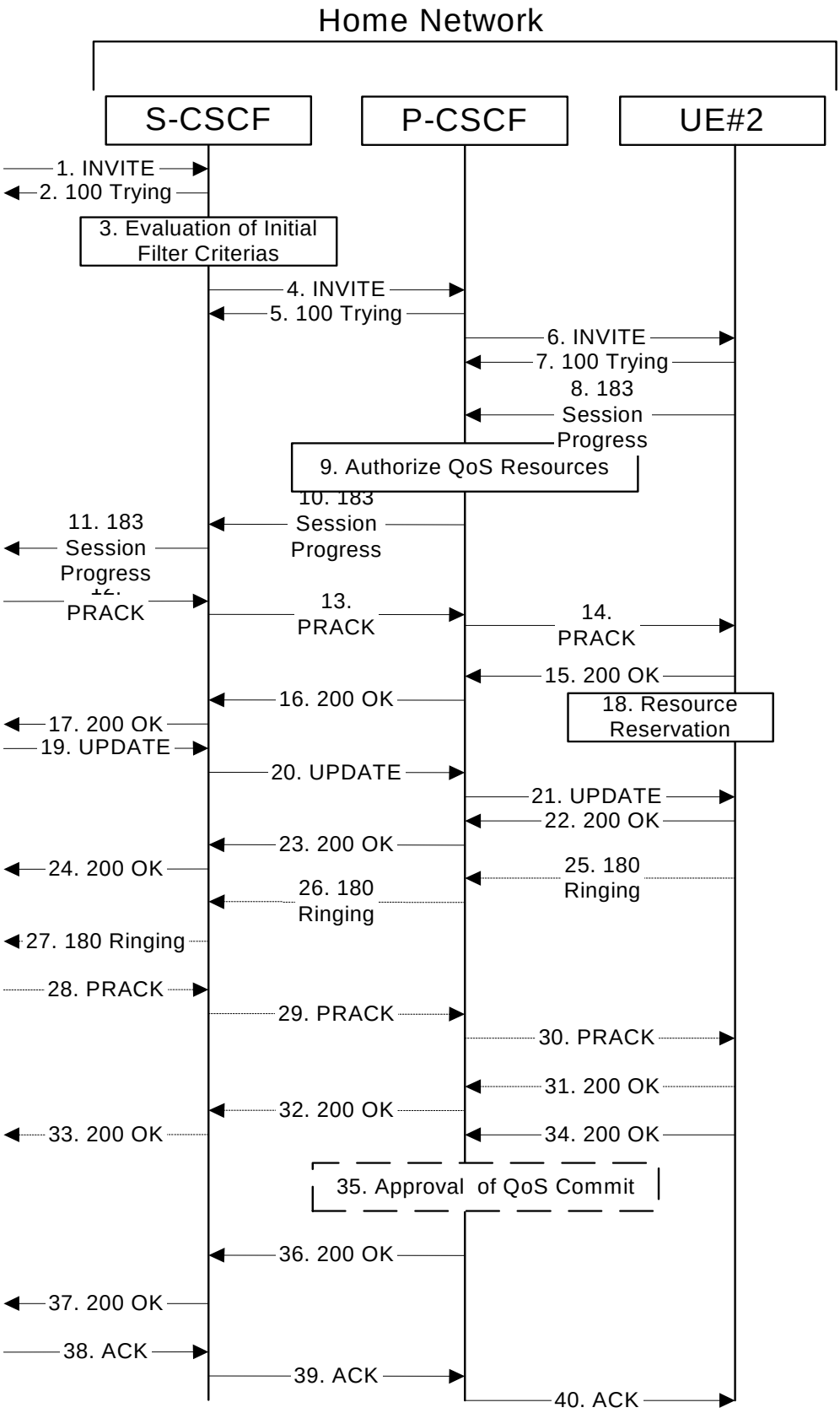


Figure 7.4.3.1-1: MT#2

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:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:sip:scscf2.home1.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
P-Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 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: user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:scscf1.home1.net, sip:pcscf1.home1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. **Evaluation of initial filter criterias**

   S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criterias.

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.

   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.

Table 7.4.3.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1 SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Route: sip:pcscf2.home2.net;lr
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID: <tel:+1-212-555-2222>
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Route: Built from the Path header 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.

P-CSCF saves information from the received INVITE request. 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: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:scscf2.home2.net, sip:scscf1.home1.net, sip:pcscf1.home1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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.

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.

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=z9hG4bK876t12.1
Max-Forwards: 65
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID:
P-Media-Authorization:
   00200001001001017064366322e78797a686f6d653512e6e6574000c02013331533134363231
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF2pdf1.~~xyz~~home1.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.

**********Next Change**********

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.

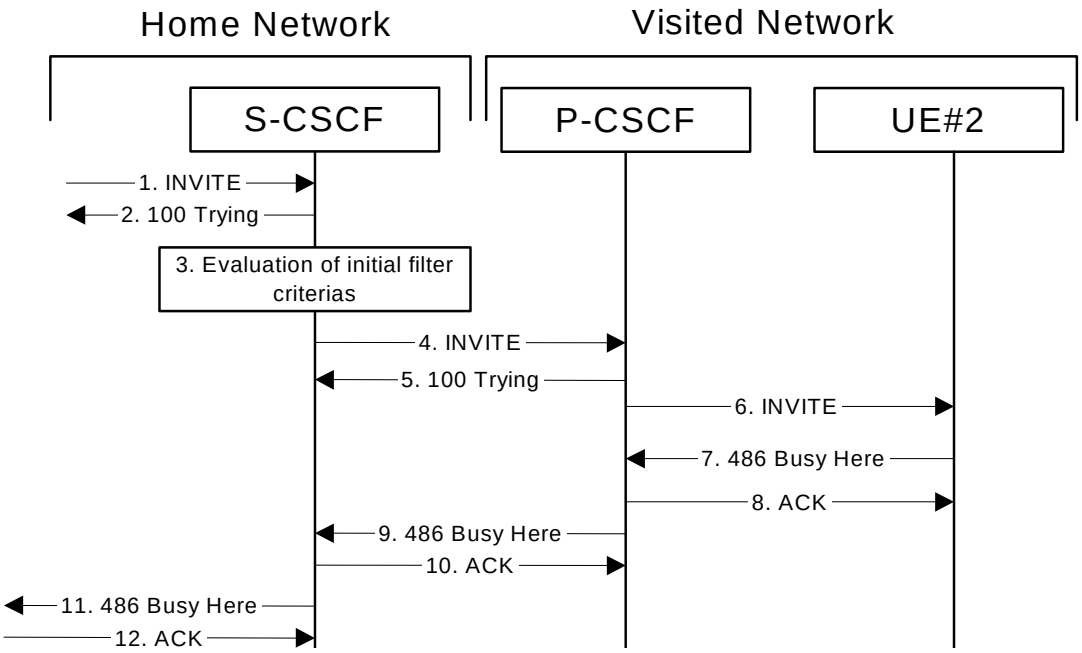


Figure 7.4.5.1-1: MT#1c

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:user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:scscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. **Evaluation of initial filter criteria**

   S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criterias.

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.

   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.

Table 7.4.5.1-4: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Route: sip:pcscf2.visited2.net;lr
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr,
sip:pcscf1.home1.net;lr
Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID: sip:user2_public1@home2.net
Content-Type:
Content-Length: (…)

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

P-Called-Party-ID: Includes the dialled URL with its parameters

Route: Built from the Path header.

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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. **INVITE (P-CSCF to UE) – see example in table 7.4.5.1-6**

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. P-CSCF 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=z9hG4bK361k21.1
Max-Forwards: 65
Asserted-Identity:
Privacy: P-Media-Authorization:
   0020000100100101706436322e76697369746564327879 7a2e6e6574000c02013331533134363231
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF2pdf2.~~xyz~~visited2.net" with credentials "31S14621".

**********Next Change**********

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.

Editor's Note: This figure still needs up dating;

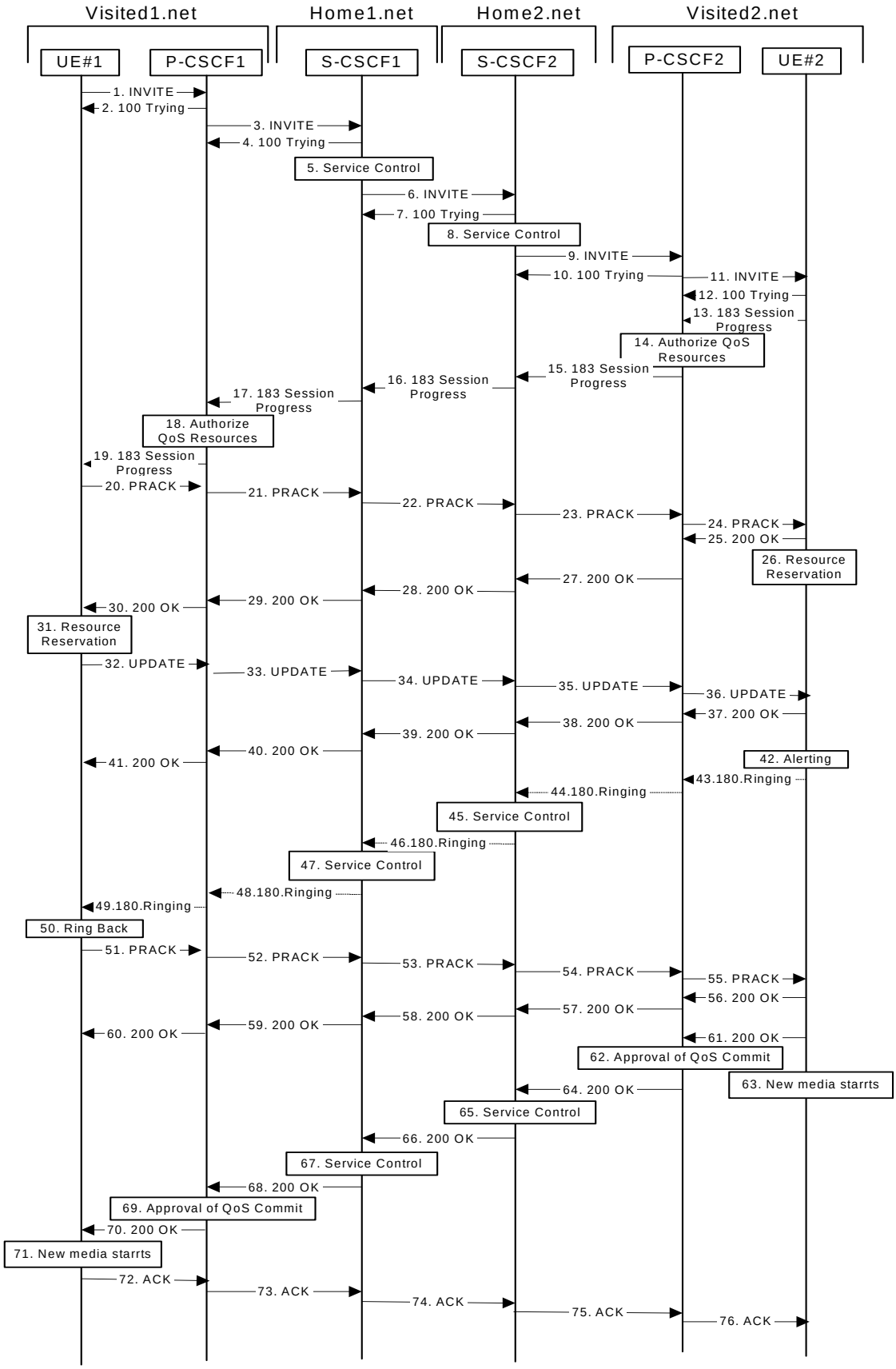


Figure 7.5.2-1: Sample multimedia signalling flow - addition of further media

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];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222; tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 132 INVITE
Require:
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
m=video 9544 RTP/AVP 31
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:31:H261/90000
```

Request-URI: Contains the keyed number from the user.

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

P-Asserted-Identity: The user provides a hint about the identity to be used for this session.

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];branch=z9hG4bKnashds7
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:scscf1.home1.net;lr, sip:scscf2.home2.net;lr, sip:pcscf2.visited2.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length:
```

5. **Evaluation of initial filter criterias**

   S-CSCF#1 validates the service profile of this subscriber and evaluates the initial filter criterias.

6. **INVITE (S-CSCF1 to S-CSCF2) - see example in table 7.5.2-6**

   S-CSCF#1 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.

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

Table 7.5.2-6: INVITE (S-CSCF1 to S-CSCF2)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Route: sip:scscf2.home2.net;lr, sip:pcscf2.visited2.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

8. **Evaluation of initial filter criterias**

S-CSCF2 validates the service profile of this subscriber and evaluates the initial filter criterias.

9. **INVITE (S-CSCF2 to P-CSCF2) - see example in table 7.5.2-9**

S-CSCF2 forwards the INVITE request tocallee's P-CSCF pcscf2.visited2.net which is in the UE2's visited network, called visited2.net

S-CSCF#2 examines the media parameters, and removes any choices that the subscriber does not have authority to request.

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:pcscf2.visited2.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

11. **INVITE (P-CSCF2 to UE2) - see example in table 7.5.2-11**

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

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.

Table 7.5.2-11: INVITE (P-CSCF2 to UE2)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=z9hG4bK361k21.1
Max-Forwards: 66
Media-Authorization:
   00200001001001017064366322e766973697465643278797a2e6e6574000c020133315331343363233
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcfPDFpdf2.xyzvisited2.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: SIP/2.0/UDP pcscf2.visited2.net;branch=z9hG4bKert23.8
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=z9hG4bK361k21.1
Privacy: none
From:
To: tel:+1-212-555-2222;tag=314159
Call-ID:
CSeq:
Require: 100rel
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote sendrecv
a=rtpmap:97 AMR
m=video 7544 RTP/AVP 31
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote sendrecv
a=rtpmap:31 H261/90000
```

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=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
P-Asserted-Identity: "John Smith" <tel:+1-212-555-2222>
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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];branch=z9hG4bKnashds7
Media-Authorization:
   00200001001001017064366312e766973697465643178797a2e6e6574000c02013942563330373400
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pdf1.~~xyz~~visited1.net" with credentials "9BV3074".

**********Next Change**********

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.

As this flow may require user interaction at the remote end to accept the proposed changes, it is realized with a re-INVITE request.

The signalling flow for changing a codec within an existing reservation is given in figure 10.3.2-1.

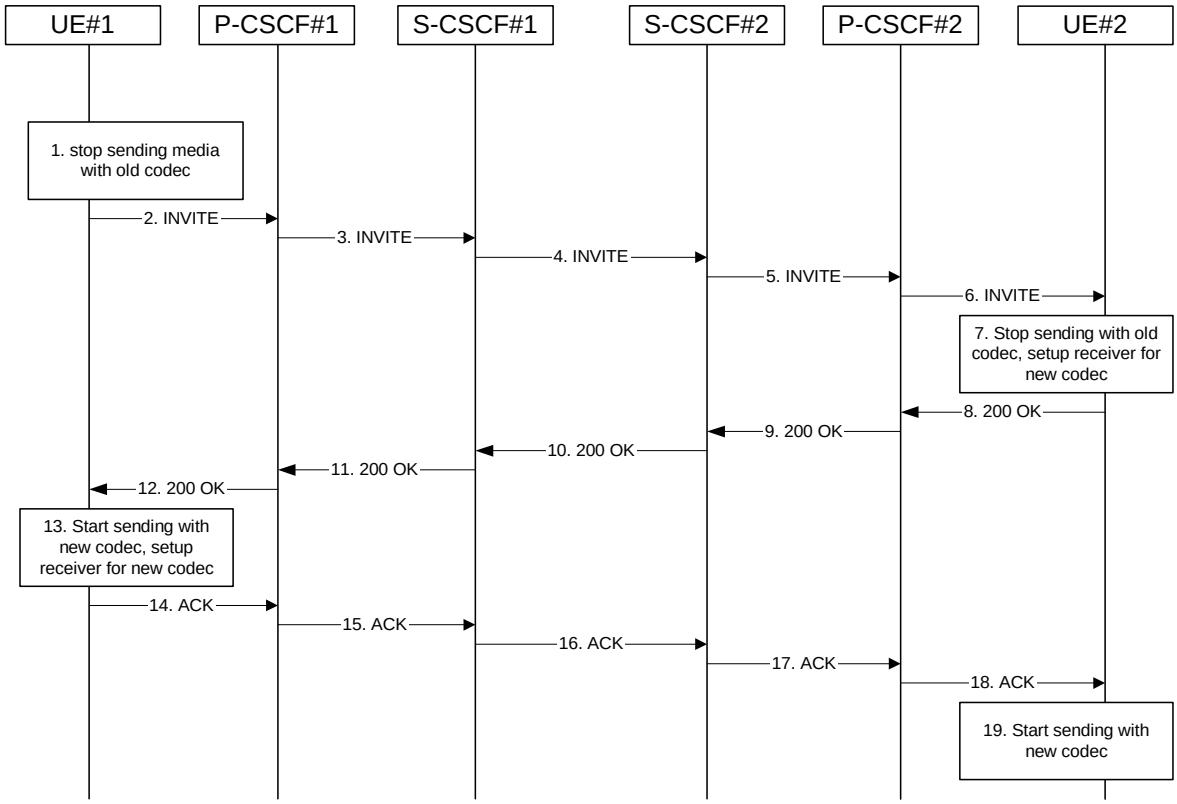


Figure 10.3.2-1: Codec or media flow change - same reservation

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy: privacy=off;party=calling
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222; 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 SIP URI that conatins 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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf1.home1.net;lr, sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Content-Type:
Content-Length:

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

Route: Saved from the 200 (OK) response to the initial INVITE.

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf2.home2.net ;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Remote-Party-ID:
RPID-Privacy:
Route: sip:pcscf2.home2.net;lr
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
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=z9hG4bK556g98.5
Max-Forwards: 66
Remote-Party-ID:
RPID-Privacy:
P-Media-Authorization:
   00200001001001017064366322e686f6d6532787797a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

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

Via: P-CSCF removes the Via headers. It inserts this as a branch value on its Via header.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcfPDFpcf2.xyzhome2.net" with credentials "31S14621".

**********Next Change**********

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 UPDATE requests and responses described in other clauses.

As this flow may require user interaction at the remote end to accept the proposed changes, it is realized with a re-INVITE request.

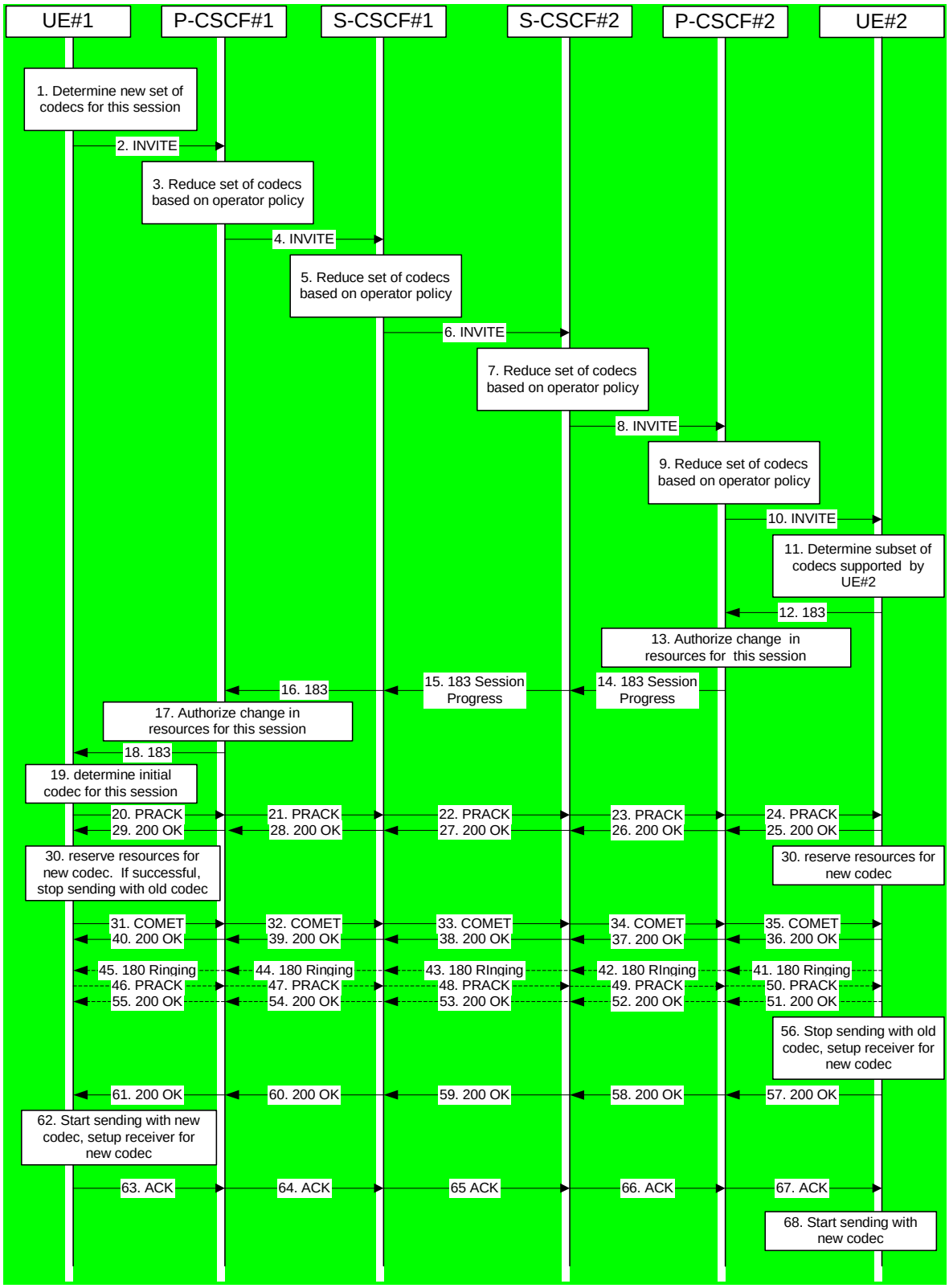


Figure 10.3.3-1: Codec or media flow change - new reservation

The detailed procedure is as follows:

1. **Determine new set of codecs for this session**

   UE#1 determines the revised set of codecs or media streams that it is 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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy: privacy=off;party=calling
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 10
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 SIP URL that contains 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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf1.home1.net;lr, sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

Route: Saved from the 200 (OK) response to the initial INVITE.

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Remote-Party-ID:
RPID-Privacy:
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Route: sip:pcscf2.home2.net;lr
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK556g98.5
Max-Forwards: 66
Remote-Party-ID:
RPID-Privacy:
P-Media-Authorization:
   00200001001001017064366322e686f6d65327a2e6e6574000c02013331533134336323 1
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

Via: P-CSCF removes the Via headers. It inserts this as a branch value on its Via header.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcfPDFpdf2.home2xyz.net" with credentials "31S14621".

11. **Determine set of codecs supported by UE#2**

UE#2 determines the set of codecs that it is capable of supporting for this session.

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 the SDP answer, 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 pcscf2.home2.net;branch=z9hG4bK556g98.5
Require: 100rel
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>
RPID-Privacy: privacy=off;party=called
From:
To:
Call-ID:
CSeq:
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 18
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote sendrecv
a=rtpmap:99:MPV
m=audio 6544 RTP/AVP 10
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos mandatory remote sendrecv
a=conf:qos remote sendrecv
```

SDP The SDP contains an answer to the received offer.

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=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:pcscf2.visited2.net;lr, sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr,
   sip:pcscf1.visited1.net;lr
Require:
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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];branch=z9hG4bKnashds7
P-Media-Authorization:
   00200001001001017064366312e686f6d6531~~78797a~~2e6e6574000c02013942563330373200
Require:
From:
To:
Call-ID:
CSeq:
Contact:
RSeq:
Content-Type:
Content-Length:

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

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~~~PDF~~pdf1.~~xyz~~home1.net" with credentials "9BV3072".

**********Next Change**********

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.

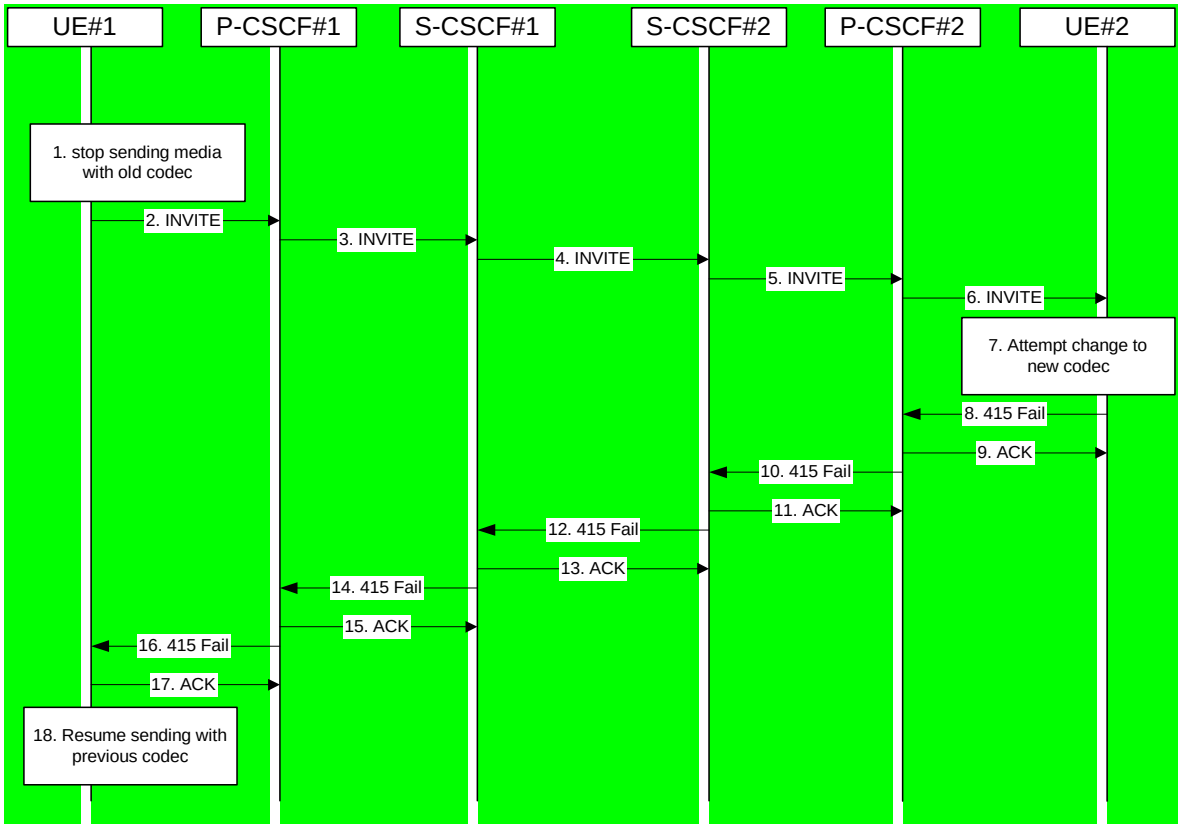


Figure 10.3.4-1: Error changing codec or media flow – within previous reservation

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy: privacy=off; party=calling
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Supported: 100rel
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:	It contains a SIP URL with 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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Remote-Party-ID:
RPID-Privacy:
Route: sip:pcscf1.home1.net;lr, sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Supported:
Contact:
Content-Type:
Content-Length:

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

Route: Saved from the 200 (OK) response to the initial INVITE

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Supported:
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Remote-Party-ID:
RPID-Privacy:
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Route: sip:pcscf2.home2.net;lr
From:
To:
Call-ID:
Cseq:
Supported:
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=z9hG4bK556g98.5
Max-Forwards: 66
Remote-Party-ID:
RPID-Privacy:
P-Media-Authorization:
   00200001001001017064366322e686f6d65327879 7a2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Supported:
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.

Via: P-CSCF removes the Via headers. It inserts this as a branch value on its Via header.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~F~~pdf2.~~xyz~~home2.net" with credentials "31S14621".

**********Next Change**********

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 returns 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 UPDATE requests and responses described in other clauses.

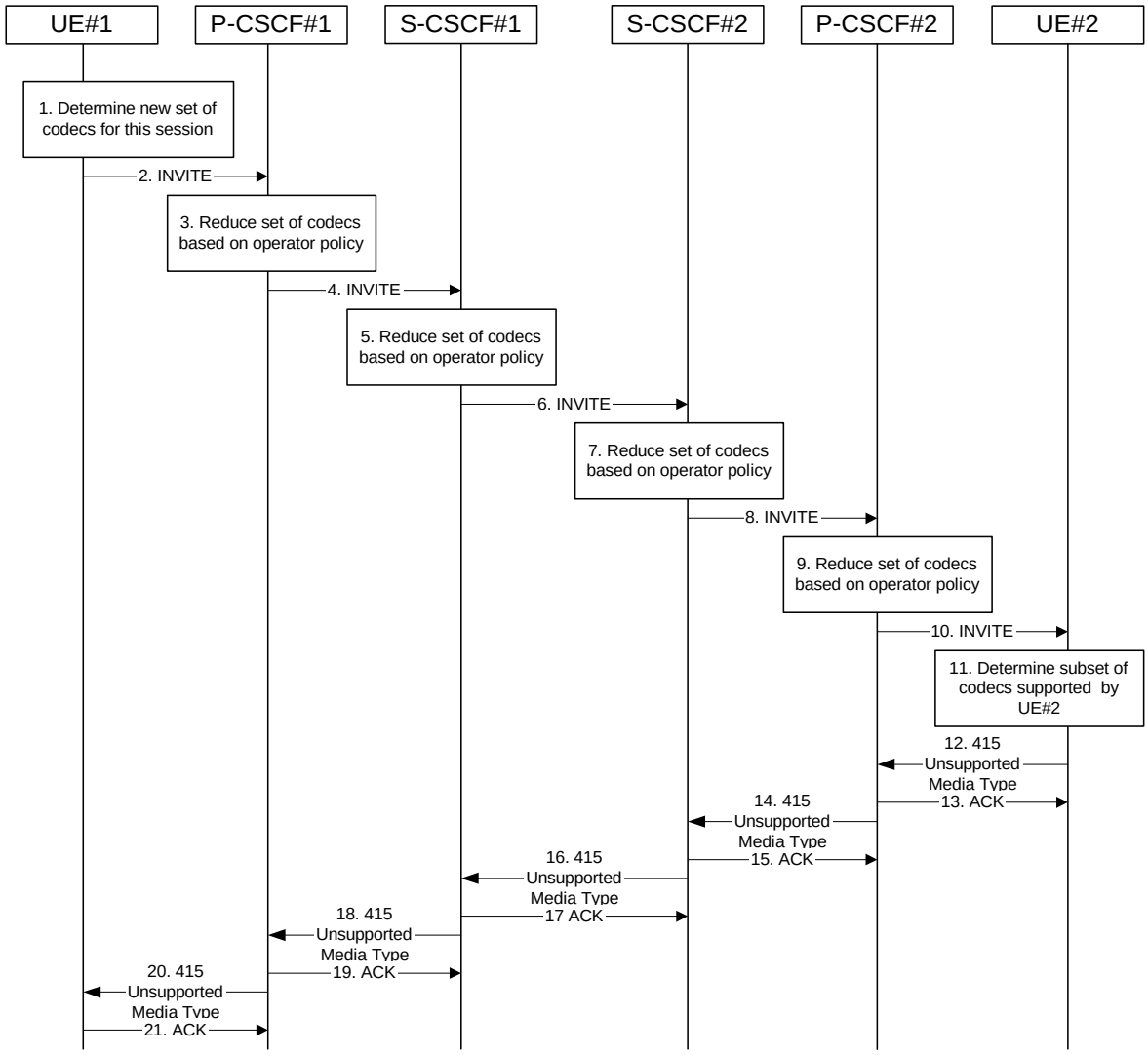


Figure 10.3.5-1: Error changing Codec or media flows needing a new reservation

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 is 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:[5555:eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy: privacy=off; party=calling
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 131 INVITE
Require: precondition
Supported:_100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 10
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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:	A SIP URI that contains 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:[5555:eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf1.home1.net;lr, sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

Route: Saved from the 200 (OK) response to the initial INVITE.

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:[5555:eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Remote-Party-ID:
RPID-Privacy:
Route: sip:scscf2.home2.net;lr, sip:pcscf2.home2.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1home1.net;lr
From:
To:
Call-ID:
Cseq:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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:[5555:eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Remote-Party-ID:
RPID-Privacy:
Route: sip:pcscf2.home2.net;lr
Record-Route: sip:scscf2.home2.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK556g98.5
Max-Forwards: 66
Remote-Party-ID:
RPID-Privacy:
P-Media-Authorization:
   00200001001001017064366322e686f6d65327~~8797a~~2e6e6574000c020133315331343363231
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

Via: P-CSCF removes the Via headers. It inserts this as a branch value on its Via header.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pcf2.~~xyz~~home2.net" with credentials "31S14621".

**********Next Change**********

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.

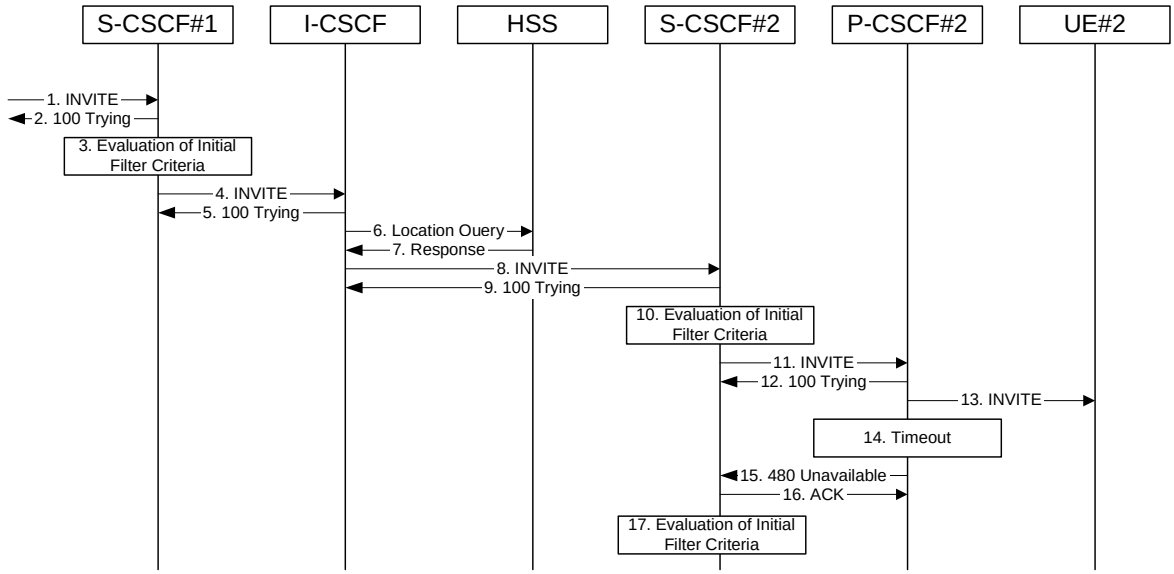


Figure 10.4.5-1: Session redirection initiated by P-CSCF

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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Route: sip:scscf2.home1.net;lr
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>;
RPID-Privacy: screen=yes
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require:
Supported:
Contact:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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 icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. **Evaluation of initial filter criterias**

    S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

11. **INVITE (S-CSCF to P-CSCF) – see example in table 10.4.5-11**

    S-CSCF remembers (from the registration procedure) the UE Contact address and the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

    S-CSCF#F 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.

Table 10.4.5-11: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Record-Route: sip:scscf2.home1.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Route: sip:pcscf1.home1.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Route: Built from the Path header stored at registration.

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.

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;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

13. **INVITE (P-CSCF to UE) – see example in table 10.4.5-13**

    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.

    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.

Table 10.4.5-13: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=z9hG4bK523r01.2
P-Media-Authorization:
   00200001001001017064366312e686f6d6531787797a2e6e6574000c02013942563330373200
Max-Forwards: 65
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=
a=
a=
a=
a=
a=
m=video 0 RTP/AVP 99
b=
a=
a=
a=
a=
a=
m=audio 3456 RTP/AVP 97 96 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=
a=
a=
a=
a=
a=
a=
a=
```

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pcf2.~~xyz~~home1.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.

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];branch=z9hG4bKnashds7
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=z9hG4bK764z87.1
From:
To:
Call-ID:
Cseq:
Content-Length:
```

17. **Evaluation of initial filter criterias**

S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

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.

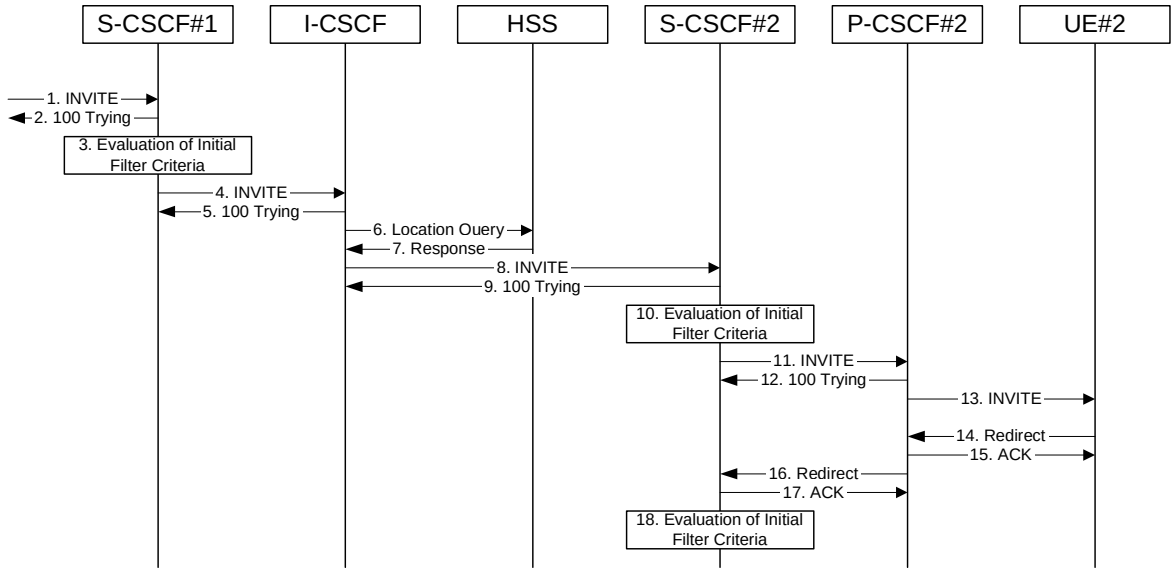


Figure 10.4.6-1: Session redirection initiated by UE

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 tel:+1-212-555-2222 SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy:
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require:
Supported:
Contact:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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 icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

10. **Evaluation of initial filter criterias**

    S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

11. **INVITE (S-CSCF to P-CSCF) – see example in table 10.4.6-11**

    S-CSCF remembers (from the registration procedure) the UE Contact address and the next hop CSCF for this UE. It forwards the INVITE request to the P-CSCF.

    S-CSCF#F 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.

Table 10.4.6-11: INVITE (S-CSCF to P-CSCF)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=z9hG4bK492e09.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Record-Route: sip:scscf2.home1.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Route: Built from the Path header stored at registration.

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.

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=z9hG4bK492e09.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK09a238.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

13. **INVITE (P-CSCF to UE) – see example in table 10.4.6-13**

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.

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.

Table 10.4.6-13: INVITE (P-CSCF to UE)

```
INVITE sip:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.home1.net;branch=z9hG4bK39z58a.1
P-Media-Authorization:
   00200001001001017064366312e686f6d6531~~78797a~~2e6e6574000c02013942563330373200
Max-Forwards: 65
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99 MPV
m=audio 3456 RTP/AVP 97 96 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pdf2.~~xyz~~home1.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.

**********Next Change**********

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.

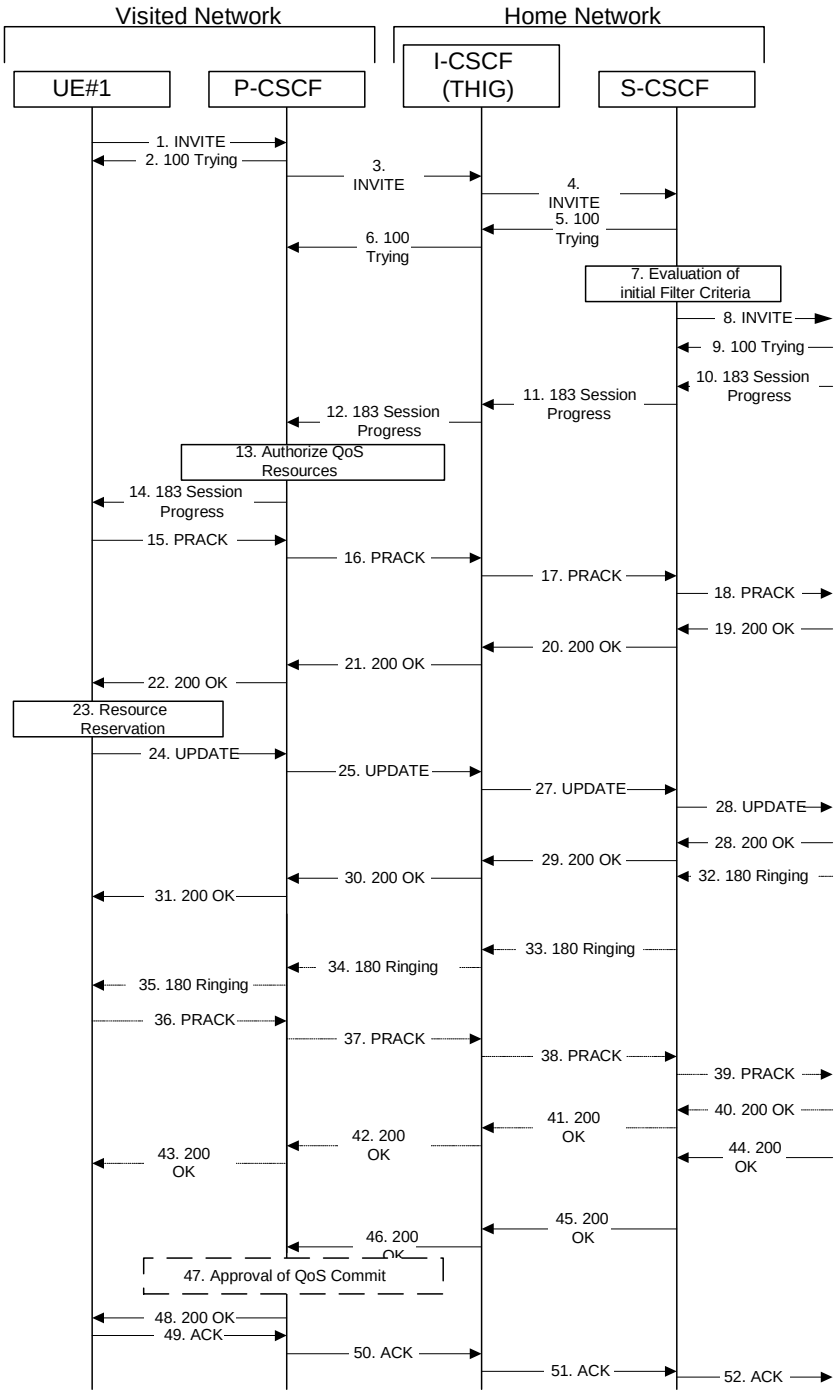


Figure 17.2.2.1-1: MO#1b

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 user2_public1@home2.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 98 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

Request-URI: Contains the public user identity of the called user.

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

Privacy: the user does not require privacy, therefore the Privacy header is set to the value “none” as specified in draft-ietf-sip-asserted-identity [17] and draft-ietf-sip-privacy-general [13].

P-Asserted-Identity: the user provides a hint about the identity to be used for this session.

Cseq: Is a random starting number.

Contact: Is a 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: user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
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];branch=z9hG4bKnashds7
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 topmost Route header 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 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:user2_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:icscf1_p.home1.net;lr, sip:Token(sip:scscf1.home1.net;lr)@home1.net;tokenized-
   by=home1.net
Record-Route: sip:pcscf1.visited1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=video 3402 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 elements from the Path header from registration.

P-Asserted-Identity: The P-CSCF inserts this header based on the user's hint present in the incoming P-Asserted-Identity header.

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:user2_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Record-Route: sip:icscf1_p.home1.net;lr, sip:pcscf1.visited1.net;lr
Route: sip:scscf1.home1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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: user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: tel:+1-212-555-2222;tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:icscf1_p.home1.net;lr, sip:pcscf1.visited1.net;lr
Contact(orig): 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=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7. **Evaluation of initial filter criteria**

S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criteria.

8. **INVITE (MO#1b to S-S) – see example in table 17.2.2.1-8**

S-CSCF 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.

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

Table 17.2.2.1-8: INVITE (MO#1b to S-S)

```
INVITE sip: user2_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Record-Route: sip:scscf1.home1.net;lr, sip:icscf1_p.home1.net;lr, sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy: none
P-Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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.

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=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:pcscf2.home1.net;lr, sip:scscf2.home1.net;lr, sip:scscf1.home1.net;lr,
   sip:icscf1_p.home1.net;lr, sip:pcscf1.visited1.net;lr
P-Asserted-Identity: "John Smith" <sip:user2_public1@home1.net>
Privacy: none
P-Asserted-Identity: "John Smith" <tel:+1-212-555-2222>
Privacy: none
From:
To: sip:user2_public1@home2.net; tag=314159
Call-ID:
CSeq:
Require: 100rel
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9021
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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
m=audio 0 RTP/AVP 97 96 0 15
```

Upon receiving the 183 Session Progress, 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 17.2.2.1-10b.

Table 17.2.2.1-10b: Storage of information at S-CSCF

```
Request-URI: sip:user2_public1@home2.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
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:scscf2.home2.net;lr, sip:pcscf2.visited2.net;lr
Route(2orig): sip:icscf1_p.home1.net;lr, sip:pcscf1.visited1.net;lr
Contact(dest): sip:[5555::eee:fff:aaa:bbb]
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
P-Asserted-Identity:
Privacy:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
m=
m=
b=
a=
a=
a=
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=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:Token(sip:pcscf2.home1.net;lr, sip:scscf2.home1.net;lr,
   scscf1.home1.net;lr)@home1.net;tokenized-by=home1.net, sip:icscf1_p.home1.net,
   sip:pcscf1.visited1.net
P-Asserted-Identity:
Privacy:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

Record-Route: Header entries of the home network of the I-CSCF are tokenized. The I-CSCF itself and the UE addresses are not subject to tokenization.

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: user2_public1@home2.net
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
Cseq(2orig): none
Route(2dest): sip:icscf1_p.home1.net;lr, sip:Token(sip:scscf1.home1.net;lr,
         sip:scscf2.home1.net;lr, pcscf2.home1.net;lr);tokenized-by=home1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
Contact(dest): sip:[5555::eee:fff:aaa:bbb]
```

13. **Authorize QoS Resources**

P-CSCF authorizes the resources necessary for this session. The approval of QoS commitment either happens at this stage or after 200 OK of INVITE (35) based on operator local policy.

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];branch=z9hG4bKnashds7
P-Asserted-Identity:
Privacy:
P-Asserted-Identity:
Privacy:
P-Media-Authorization:
   00200001001001017064366312e76697369746564327879 7a2e6e6574000c02013942563330373200
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~PDF~~pdf1.~~xyz~~visited1.net" with credentials "9BV3072". "00" at the end of the authorization token is required to pad to a multiple of 4 bytes.

**********Next Change**********

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.

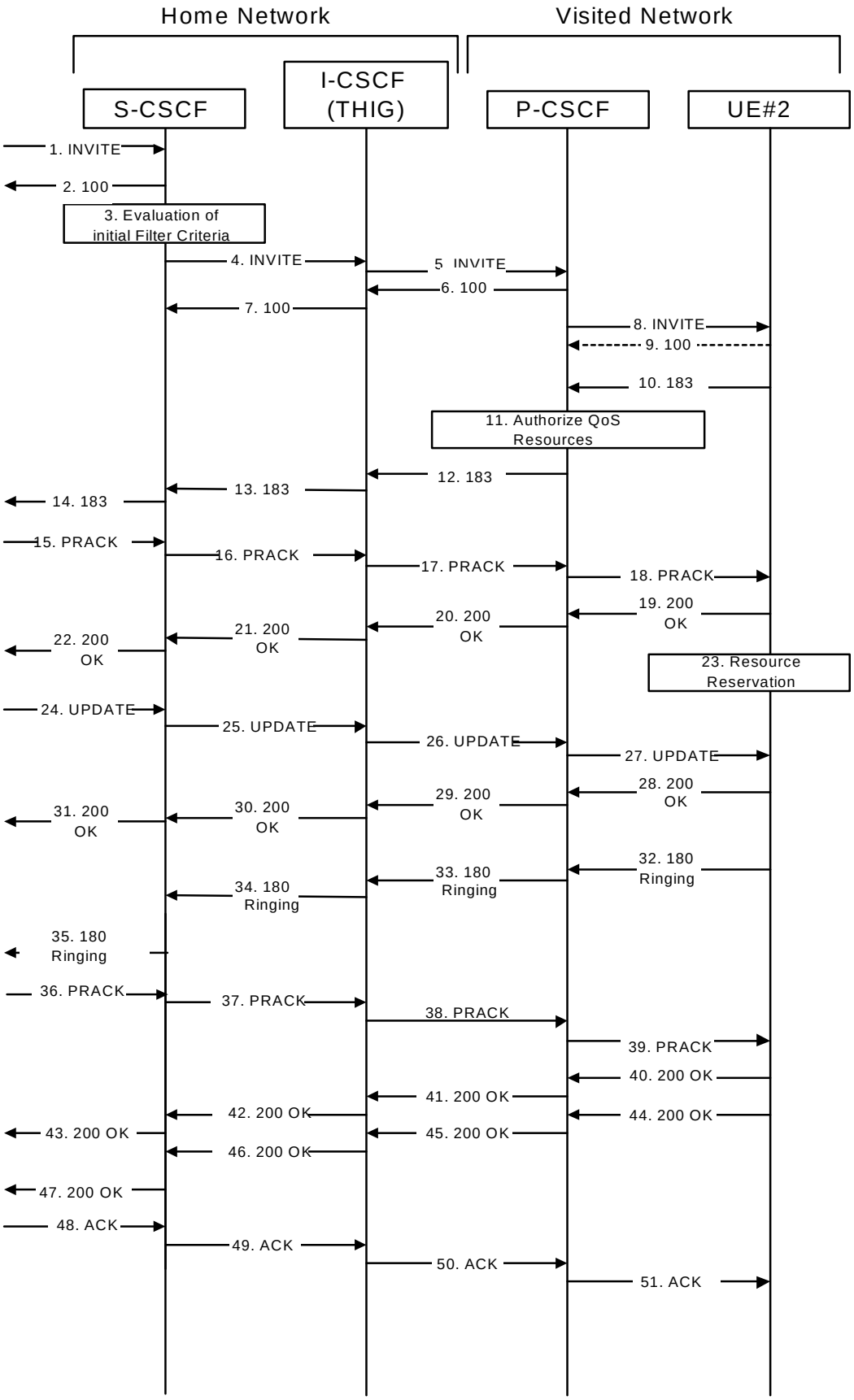


Figure 17.4.2.1-1: MT#1b

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: user2_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:scscf2.home1.net;lr
Record-Route: sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy: none
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
Call-ID: cb03a0s09a2sdfglkj490333
Cseq: 127 INVITE
Require: preconditions
Supported: 100rel
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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 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: user2_public1@home1.net
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2orig): sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr, sip:[5555::aaa:bbb:ccc:ddd]
Route(2dest): sip:icscf2_p.home1.net;lr, sip:pcscf2.visited2.net;lr,
   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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

3. **Evaluation of initial filter criteria**

   S-CSCF validates the service profile of this subscriber, and evaluates the initial filter criteria.

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.

   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.

Table 17.4.2.1-4: INVITE (S-CSCF to I-CSCF)

```
INVITE sip: [5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Route: sip: icscf2_p.home1.net;lr, sip:pcscf2.visited2.net;lr
Record-Route: sip:scscf2.home1.net;lr, sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr
P-Asserted-Identity:
Privacy:
P-Asserted-Identity: "John Doe" <tel:+1-212-555-1111>
Privacy: none
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID: <sip:user2_public1@home2.net>
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97 96 0 15
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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=z9hG4bKa9012.1, SIP/2.0/UDP Token(SIP/2.0/UDP
   scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 65
Route: sip:pcscf2.visited2.net;lr
Record-Route: sip:icscf2_p.home1.net;lr, sip:Token(sip:scscf2.home1.net;lr,
   sip:scscf1.home1.net;lr, sip:pcscf1.home1.net;lr)@home1.net;tokenized-by=home1.net
P-Asserted-Identity:
Privacy:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
P-Called-Party-ID:
Content-Type:
Content-Length:

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

P CSCF saves information from the received INVITE request. 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: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
Call-ID: cb03a0s09a2sdfglkj490333
CSeq(2dest): 127 INVITE
CSeq(2orig): none
Route(2dest): sip:[5555::eee:fff:aaa:bbb]
Route(2orig): sip:icscf2_p.home1.net;lr, sip:Token(sip:scscf2.home1.net;lr,
   sip:cscf1.home1.net;lr, sip:pcscf1.home1.net;lr)@home1.net;tokenized-by=home1.net
```

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=z9hG4bKa9012.1, SIP/2.0/UDP Token(SIP/2.0/UDP
   scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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.

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.

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=z9hG4bK361k21.1
Max-Forwards: 64
P-Media-Authorization:
   00200001001001017064~~3~~66322e766973697465643278~~797a~~2e6e6574000c020133315331343363231
P-Asserted-Identity:
Privacy:
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
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
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=video 0 RTP/AVP 99
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecva=rtpmap:98 H261
a=rtpmap:99:MPV
m=audio 3456 RTP/AVP 97
b=AS:25.4 96 15
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote 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
b=AS:25.4
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
a=rtpmap:96 G726-32/8000
```

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.

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~F~~pdf2.~~xyz~~visited2.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.

**********Next Change**********

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.

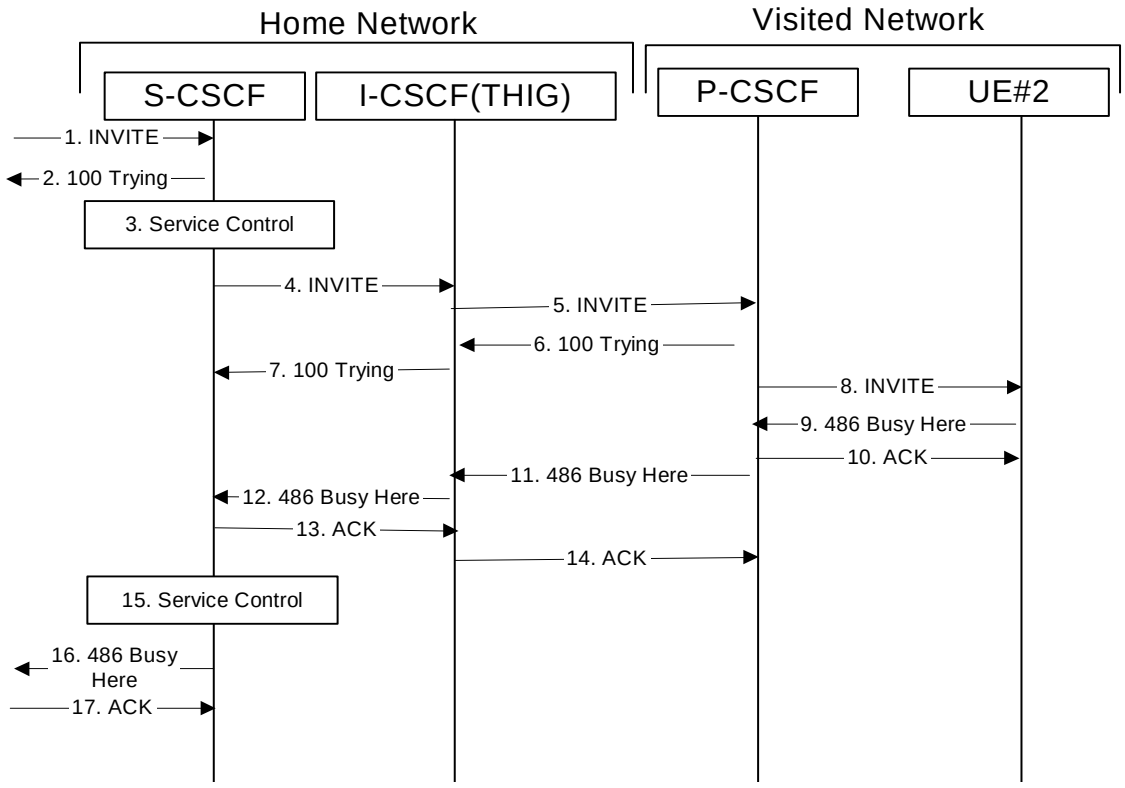


Figure 17.4.5.1-1: MT#1d

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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net
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#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=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bKa9012.1, SIP/2.0/UDP
   Token(scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bKa9012.1, SIP/2.0/UDP
   Token(scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   pcscf1.home1.net;branch=z9hG4bK431h23.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK361k21.1
Media-Authorization:
   00200001001001017064366322e766973697465643278797a2e6e6574000c020133315331343363231
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 "~~pcf~~PDF~~PDF~~pdf2.~~xyz~~visited2.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=z9hG4bK361k21.1
From:
To: tel:+1-212-555-2222;tag=314159
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=z9hG4bK361k21.1
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=z9hG4bKa9012.1, SIP/2.0/UDP
    Token(scscf2.home1.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
    icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
    scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK764z87.1, SIP/2.0/UDP
    icscf2_s.home1.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
    scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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 Requet-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=z9hG4bK764z87.1
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=z9hG4bKa9012.1@ SIP/2.0/UDP
    Token(scscf2.home1.net;branch=z9hG4bK764z87.1
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=z9hG4bK871y12.1, SIP/2.0/UDP
    scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP pcscf1.home1.net;branch=z9hG4bK431h23.1,
    SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK332b23.1
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.

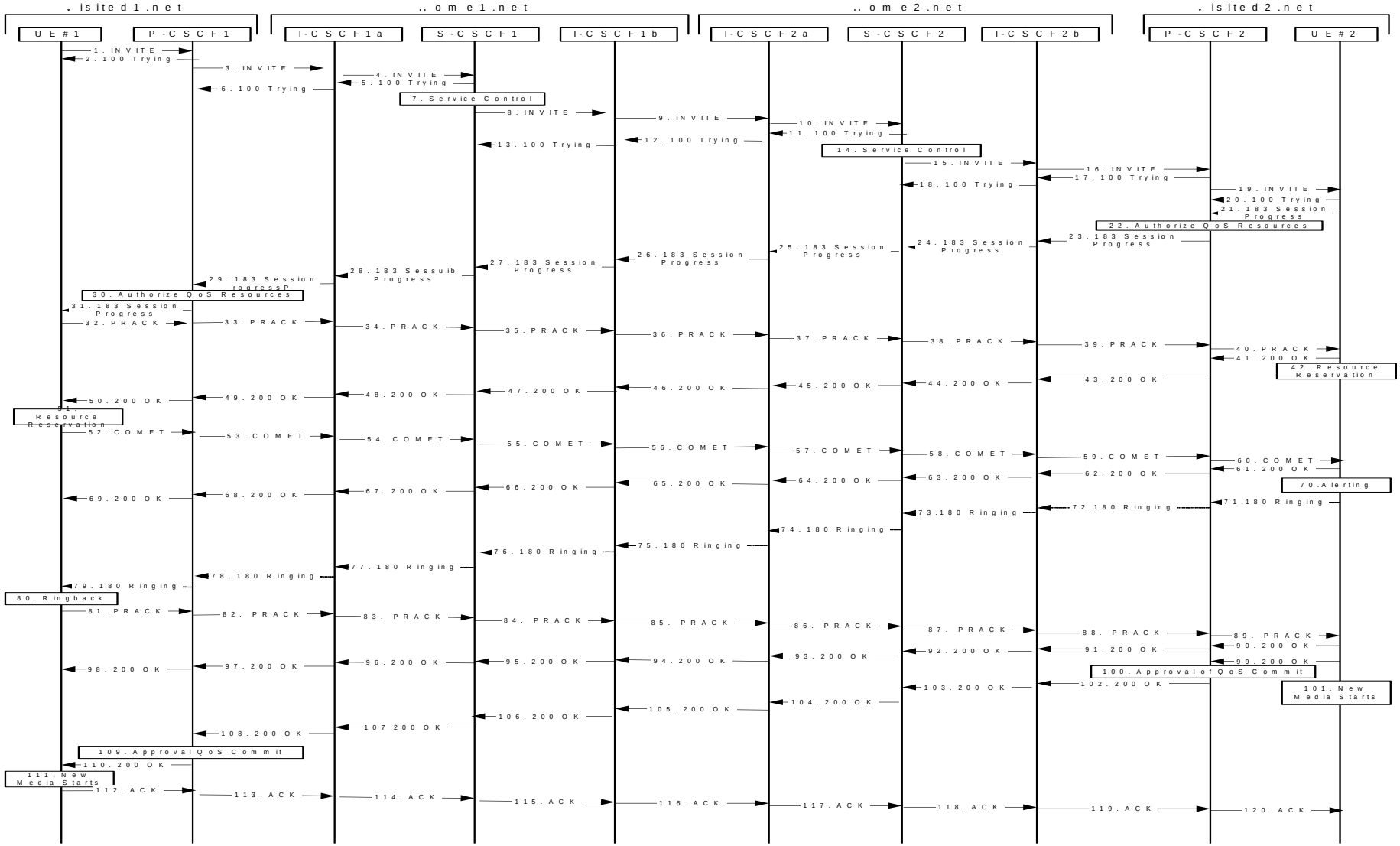


Figure 17.5.2-1: Sample multimedia signalling flow - additional of further media with I-CSCF (THIG)

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];branch=z9hG4bKnashds7
Max-Forwards: 70
Remote-Party-ID: "John Doe" <tel:+1-212-555-1111>
RPID-Privacy: privacy=off
From: sip:user1_public1@home1.net; tag=171828
To: sip:user2_public1@home2.net; tag=314159
Call-ID: cb03a0s09a2sdfglkj490333
CSeq: 132 INVITE
Require: precondition
Supported: 100rel
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=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
m=video 9544 RTP/AVP 31
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=rtpmap:31 H261/90000
```

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 procedure for specifying dialled digits.

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

Remote-Party-ID: Contains the originator's public user identity. The Display name is optional.

From:/To:/Call-ID: Follow the recommendations of draft-ietf-sip-privacy [13], even though anonymity is not being requested for this session.

Cseq: Is a random starting number.

Contact: Is a SIP URL that contains 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-CSCF 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];branch=z9hG4bKnashds7
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:icscf1_p.home1.net;lr, sip:token(sip:scscf1.home1.net;lr,
   sip:icscf1_s.home1.net;lr)@home1.net;tokenized-by=home1.net, sip:icscf2_s.home2.net;lr,
   sip:token(sip:scscf2.home2.net;lr, sip:icscf2_p.home2.net;lr)@home2.net;tokenized-
   by=home2.net, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

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

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Route: sip:scscf1.home1.net;lr, sip:icscf1_s.home1.net;lr, sip:icscf2_s.home2.net;lr,
   sip:token(sip:scscf2.home2.net;lr, sip:icscf2_p.home2.net;lr)@home2.net;tokenized-
   by=home2.net, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7. **Evaluation of initial filter criterias**

   S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 67
Route: sip:icscf1_s.home1.net;lr, sip:icscf2_s.home2.net;lr,
   sip:token(sip:scscf2.home2.net;lr, sip:icscf2_p.home2.net;lr)@home2.net;tokenized-
   by=home2.net, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy: privacy=off;screen=yes
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 66
Route: sip:icscf2_s.home2.net;lr, sip:token(sip:scscf2.home2.net;lr,
   sip:icscf2_p.home2.net;lr)@home2.net;tokenized-by=home2.net, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 65
Route: sip:scscf2.home2.net;lr, sip:icscf2_p.home2.net;lr, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

14. **Evaluation of initial filter criterias**

S-CSCF validates the service profile of this subscriber and evaluates the initial filter criterias.

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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 64
Route: sip:icscf2_p.home2.net;lr, sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length: (…)

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP icscf2_p.home2.net;branch=z9hG4bK556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1)@home2.net;tokenized-by=home2.net, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 63
Route: sip:pcscf2.visited2.net;lr
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
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=z9hG4bK556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1)@home2.net;tokenized-by=home2.net, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
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:[5555::eee:fff:aaa:bbb] SIP/2.0
Via: SIP/2.0/UDP pcscf2.visited2.net;branch=z9hG4bK361k21.1
Max-Forwards: 62
P-Media-Authorization:
   00200001001001017064366322e76697369746564327~~8797a~~2e6e6574000c020133315331343363233
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
Cseq:
Require:
Supported:
Contact:
Content-Type:
Content-Length:

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

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "~~pcf~~PDF~~pcf~~2.~~xyz~~visited2.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=z9hG4bKert23.8 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=z9hG4bK361k21.1
Remote-Party-ID: "John Smith" <tel:+1-212-555-2222>
RPID-Privacy: privacy=off;party=called
From:
To: sip:user2_public1@home2.net; tag=314159
Call-ID:
CSeq:
Require: 100rel
Contact: sip:[5555::eee:fff:aaa:bbb]
RSeq: 9022
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=curr:qos local sendrecv
a=curr:qos remote sendrecv
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=conf:qos remote sendrecv
a=rtpmap:97 AMR
a=fmtp:97 mode-set=0,2,5,7; maxframes=2
m=video 7544 RTP/AVP 31
b=AS:54.6
a=curr:qos local none
a=curr:qos remote none
a=des:qos mandatory local sendrecv
a=des:qos none remote sendrecv
a=conf:qos remote sendrecv
a=rtpmap:31 H261/90000
```

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=z9hG4bK556u87.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf2.home2.net;branch=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1)@home2.net;tokenized-by=home2.net, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK764z87.1, SIP/2.0/UDP
   icscf2_s.home2.net;branch=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK871y12.1, SIP/2.0/UDP
   icscf1_s.home1.net;branch=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy: privacy=off;screen=yes
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK312a32.1, SIP/2.0/UDP token(SIP/2.0/UDP
   scscf1.home1.net;branch=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1)@home1.net;tokenized-by=home1.net, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK332b23.1, SIP/2.0/UDP
   icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

v=
o=
s=
c=
t=
m=
b=
a=
a=
a=
a=
a=
a=
a=
m=
b=
a=
a=
a=
a=
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=z9hG4bK351g45.1, SIP/2.0/UDP
   pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
   [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

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)

```
SIP/2.0 183 Session Progress
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
P-Media-Authorization:
   00200001001001017064366312e766973697465643178797a2e6e6574000c02013942563330373400
Remote-Party-ID:
RPID-Privacy:
From:
To:
Call-ID:
CSeq:
Require:
Contact:
RSeq:
Content-Type:
Content-Length:

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

P-Media-Authorization: A P-CSCF generated authorization token. This particular example shows a Policy-Element generated by "pcfPDFpdf1.xyzvisited1.net" with credentials "9BV3074".

3GPP TSG-CN1 Meeting #27 ***Tdoc N1-022387***
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **24.229** **CR** **289** ⌘**rev** **-** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	PCF to PDF change
Source:	⌘	Lucent Technologies
Work item code:	⌘	IMS-CCR
Date:	⌘	11/11/2002
Category:	⌘	**F**
Release:	⌘	*Rel-5*

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Within SA2, tt was agreed to use the Policy Decision Function teminology for compatibiltiy with other access networks (S2-023124Rev2) for all documents from Release 5.
Summary of change:	⌘	Replace the term Policy Control Function with Policy Decision Function throughout the document.
Consequences if not approved:	⌘	Confusion between the 3GPP and other architectures.

Clauses affected:	⌘	5.2.7.2 and 5.2.7.3				
		Y	**N**			
Other specs	⌘	**X**	**X**	Other core specifications	⌘	23.002, 23.207, 23.228, 24.228, 29.207, 29.208
affected:			**X**	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.2.7 Initial INVITE

5.2.7.1 Introduction

In addition to following the procedures for initial requests defined in subclause 5.2.6, initial INVITE requests also follow the procedures of this subclause.

5.2.7.2 Mobile-originating case

The P-CSCF shall respond to all INVITE requests with a 100 (Trying) provisional response.

Upon receiving a response (e.g. 183 (Session Progress), 200 (OK)) to the initial INVITE request, the P-CSCF:

- if a media authorization token is generated by the ~~PCF~~PDF as specified in RFC 3313 [31] (i.e. when service-based local policy control is applied), insert the P-Media-Authorization header containing that media authorization token.

When the P-CSCF sends the UPDATE request towards the S-CSCF, the P-CSCF shall also include the gprs-charging-info parameter in the P-Charging-Vector header. See subclause 5.2.7.4 for further information on the GPRS charging information.

5.2.7.3 Mobile-terminating case

When the P-CSCF receives an initial INVITE request destined for the UE, it will contain the URL of the UE in the Request-URI, and a single pre-loaded Route header. The received initial INVITE will also have a list of Record-Route headers. Prior to forwarding the initial INVITE to the URL found in the Request-URI, the P-CSCF shall:

- if a media authorization token is generated by the ~~PCF~~PDF as specified in RFC 3313 [31] (i.e. when service-based local policy control is applied), insert the P-Media-Authorization header containing that media authorization token.

In addition, the P-CSCF shall respond to all INVITE requests with a 100 (Trying) provisional response.

When the P-CSCF sends 180 (Ringing) or 200 (OK) (to INVITE) towards the S-CSCF, the P-CSCF shall also include the gprs-charging-info parameter in the P-Charging-Vector header. See subclause 5.2.7.4 for further information on the GPRS charging information.