Technical Specification Group Services and System Aspects ***TSGS#17(02)0534***

Meeting #17, Biarritz, France, 9-12 September 2002

**Source:** **TSG SA WG2**
**Title:** **CRs on 23.228**
**Agenda Item:** **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #16.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

| **Tdoc #** | **Title** | **Spec** | **CR #** | **cat** | **Version in** | **WI** | **S2 meeting** |
|---|---|---|---|---|---|---|---|
| S2-021949 | The use of the Secondary PDP Context Activation Procedure for IMS | 23.228 | 175 r1 | F | 5.5.0 | IMS-CCR | 25 |
| S2-022641 | Modification of IMS Signalling PDP context | 23.228 | 176 r2 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022002 | Clarification on terminology in 23.228: user and subscriber | 23.228 | 178 r2 | F | 5.5.0 | IMS | 25 |
| S2-021954 | Clarification on registration procedures | 23.228 | 179 | F | 5.5.0 | IMS | 25 |
| S2-021899 | Procedures for providing or blocking identity | 23.228 | 180 r1 | F | 5.5.0 | IMS-CCR | 25 |
| S2-021898 | Corrections on session redirection procedures | 23.228 | 181 r1 | F | 5.5.0 | IMS-CCR | 25 |
| S2-021947 | Policy control procedures on PDP context modification | 23.228 | 182 r1 | F | 5.5.0 | IMS-CCR | 25 |
| S2-022037 | Location information in IMS | 23.228 | 183 r5 | F | 5.5.0 | IMS-CCR | 25 |
| S2-022529 | Re-registration procedures | 23.228 | 185 r1 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022125 | Deletion of ISC interface support for control of timers | 23.228 | 187 | F | 5.5.0 | IMS | 26 |
| S2-022643 | Support of Originated Requests from Application Servers | 23.228 | 188 r2 | F | 5.5.0 | IMS | 26 |
| S2-022642 | Updates to unify draft changes | 23.228 | 195 r2 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022345 | Private ID cleanup | 23.228 | 197 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022544 | ISC cleanup | 23.228 | 198 r1 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022557 | Emergency sessions | 23.228 | 199 r1 | F | 5.5.0 | IMS-CCR | 26 |
| S2-022644 | Clarification on Filter Criteria | 23.228 | 202 r1 | F | 5.5.0 | IMS-CCR | 26 |

**3GPP TSG-SA WG2 Meeting #25**
**Naantali, Finland, 24th – 28th June**

***Tdoc S2-021949***

*CR-Form-v5*

# CHANGE REQUEST

⌘ **23.228 CR 175** ⌘**rev** **1** ⌘ Current version: **5.5.0** ⌘

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

***Proposed change affects:*** ⌘ (U)SIM □ ME/UE ☒ Radio Access Network □ Core Network ☒

| | | | | | |
|---|---|---|---|---|---|
| ***Title:*** | ⌘ | The use of the Secondary PDP Context Activation Procedure for IMS | | | |
| ***Source:*** | ⌘ | Ericsson | | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** | ⌘ | 26-06-2002 |
| ***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)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | CN1 has decided that the PCO IE may be used by the UE to request the P-CSCF address and to indicate that the PDP context will be used for IMS signalling. It is clear that the PCO IE may not reach the GGSN when using the Secondary PDP Context Activation Procedure. However, it must anyway be possible to use the procedure to establish a PDP context for IMS signalling as there is a risk, as described in chapter 5.10.3.0, that the PDP context used for signalling is lost. |
| ***Summary of change:*** | ⌘ | It is clarified that it needs to be possible to establish a PDP context for the IMS signalling by using the Secondary PDP Context Activation Procedure as defined in 23.060. It is also clarified that the request for a P-CSCF address in the “GPRS procedure for P-CSCF discovery” is only transparent when using the PDP Context Activation Procedure. |
| ***Consequences if not approved:*** | ⌘ | It may not be possible to re-establish a PDP context for IMS signalling if it is lost. |

| | | | | |
|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.1.1.2 and 5.10.3.0 | | |
| ***Other specs affected:*** | ⌘ | ☒ Other core specifications<br>□ Test specifications<br>□ O&M Specifications | ⌘ | 24.229 |
| ***Other comments:*** | ⌘ | | | |

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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 **********************

## 5.1.1 Procedures related to local CSCF discovery

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

1. Use of DHCP to provide the UE with the domain name of a Proxy-CSCF and the address of a Domain Name Server (DNS) that is capable of resolving the Proxy-CSCF name, as described below in clause 5.1.1.1.

2. Transfer a Proxy-CSCF address within the PDP Context Activation signalling to the UE, as described below in clause 5.1.1.2. The UE shall request the P-CSCF address(es) from the GGSN when activating the PDP context. The GGSN shall send the P-CSCF address(es) to the UE when accepting the PDP context activation. Both the P-CSCF address(es) request and the P-CSCF address(es) shall be sent transparently through the SGSN.

### 5.1.1.1 DHCP/DNS procedure for P-CSCF discovery

The GGSN acts as a DHCP Relay Agent, relaying DHCP messages between UE and the DHCP server.

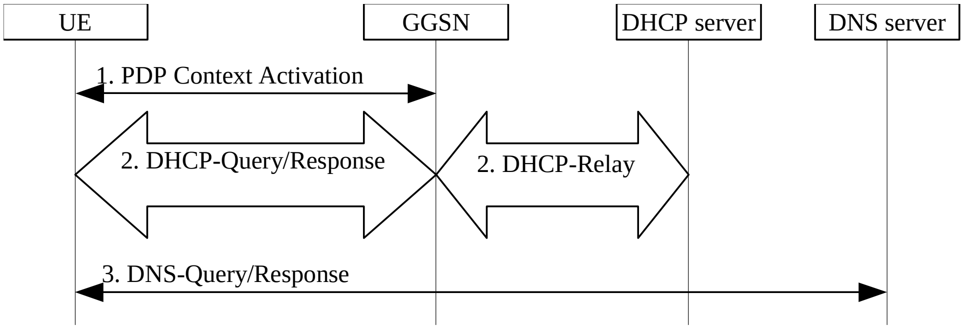

**Figure 5.0a: P-CSCF discovery using DHCP and DNS**

1. Create PDP context bearer by using the procedure as specified in TS 23.060.

2. The UE requests a DHCP server and additionally requests the domain name of the P-CSCF and IP addresses of DNS servers. It may require a multiple DHCP Query/Response message exchange to retrieve the requested information.

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

After reception of domain name and IP address of a P-CSCF the UE may initiate communication towards the IM subsystem.

### 5.1.1.2 GPRS procedure for P-CSCF discovery

This alternative shall be used for UE(s) not supporting DHCP. This may also be used for UE(s) supporting DHCP.

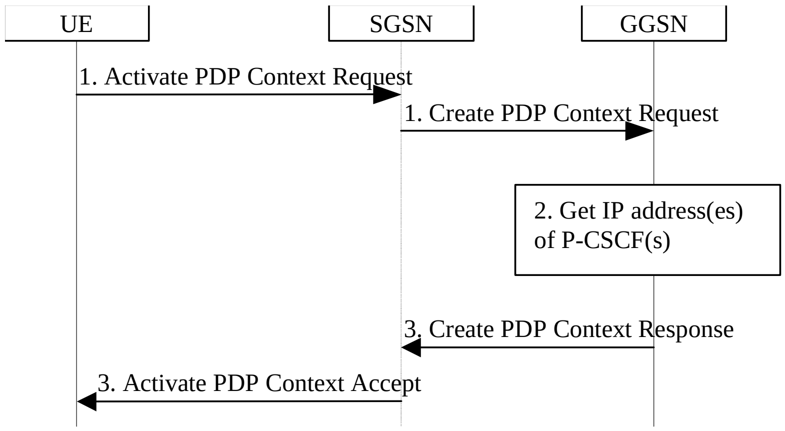
UE
SGSN
GGSN
1. Activate PDP Context Request
1. Create PDP Context Request
2. Get IP address(es) of P-CSCF(s)
3. Create PDP Context Response
3. Activate PDP Context Accept

**Figure 5.0b: P-CSCF discovery using PDP Context Activation signalling**

1. The UE requests establishment of a PDP context according to section 4.2.6 (QoS requirements for IM CN subsystem signalling). The UE indicates that it requests a P-CSCF IP address(es). The indication is forwarded transparently by the SGSN to the GGSN.

2. The GGSN gets the IP address(es) of the P-CSCF(s). The mechanism to do this is a matter of internal configuration and is an implementation choice.

3. If requested by the UE, the GGSN includes the IP address(es) of the P-CSCF(s) in the Create PDP Context Response. The P-CSCF address(es) is forwarded transparently by the SGSN to the UE.

After reception of the IP address of a P-CSCF the UE may initiate communication towards the IM subsystem.

Note. This request of a P-CSCF IP address(es) and response is not transparent ~~also~~ for pre-R5 SGSN when using the ~~in primary~~ Secondary PDP C~~c~~ontext A~~a~~ctivation Procedure as defined in TS 23.060 [23].

### 5.1.2 Procedures related to Serving-CSCF assignment

****************** Second Change **********************

## 5.10.3 Network initiated session release

### §5.10.3.0 Deletion of PDP context used to transport IMS SIP signalling

It is possible that the GPRS subsystem deletes the PDP context used to transport IMS SIP signalling (e.g. due to routing area update, overload situations).

In this case the UE shall initiate a procedure to re-establish a PDP context to transport IMS SIP signalling. If there are any IMS related PDP contexts active the re-establishment of the PDP context to transport IMS signalling shall be perfomed by using the Secondary PDP Context Activation Procedure as defined in TS 23.060 [23]. If re-establishment fails then the UE shall de-activate all other IMS related~~associated~~ PDP context(s).

### 5.10.3.1 Network initiated session release - P-CSCF initiated

**3GPP TSG-SA WG2 Meeting #26** **_Tdoc S2-022641_**
**Toronto, Canada, 19th – 23rd August**

*CR-Form-v7*

# CHANGE REQUEST

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ⌘ | **TS 23.228** | **CR** | **176** | ⌘**rev** | **2** | ⌘ | Current version: | **5.5.0** ⌘ |

*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:*** | ⌘ | Modification of IMS signalling PDP context (alignment with stage 3) | | |
| ***Source:*** | ⌘ | Ericsson | | |
| ***Work item code:*** | ⌘ | E2EqoS | ***Date:*** ⌘ | 14/08/2002 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | REL-5 |
| | | *Use one of the following categories:*<br>***F*** *(correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(addition of feature),*<br>***C*** *(functional modification of feature)*<br>***D*** *(editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*Rel-4 (Release 4)*<br>*Rel-5 (Release 5)*<br>*Rel-6 (Release 6)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | Misalignment with stage 3 |
| ***Summary of change:*** | ⌘ | Added that a generic purpose PDP context can not change to a dedicated signalling PDP context one and vice versa. |
| ***Consequences if not approved:*** | ⌘ | The stage 2 specification is not clear, misleading, and not aligned with the stage 3 specification. |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.1.0 | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | | **X** | Other core specifications | ⌘ | |
| | | | **X** | Test specifications | | |
| | | | **X** | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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# 5.1 CSCF related procedures

## 5.1.0 Establishing PDP Context for IM Subsystem Related Signalling

Before the UE can request IM services, a PDP context must be activated to carry IM Subsystem related signalling.

It shall be possible for the UE to convey to the network the intention of using the PDP context for IM Subsystem related signalling. For this purpose it uses the mechanism for ‘PDP Context Used for Application Level Signalling Transport’ as described in TS23.207. A signalling flag determines any rules and restrictions that shall apply at the GGSN for that PDP context, as described in section 4.2.6. It shall not be possible to modify a general purpose PDP context into a dedicated PDP context for IM Subsystem related signalling and vice versa.

The QoS profile parameters for this PDP context are appropriate for IM Subsystem related signalling. The QoS profile parameters are detailed in TS23.107. The signalling flag and the QoS profile parameters may be used independently of each other.

## 5.1.1 Procedures related to local CSCF discovery

CR-Form-v4

# CHANGE REQUEST

**3GPP TSG-SA2 Meeting #25**
**Finland, 24 – 28th June, 2002**

***Tdoc S2-022002***

## 1st modified section

## 3.1 Definitions

Refer to TS 23.002 [1] for the definitions of some terms used in this document.

For the purposes of the present document the following additional definitions apply.

**IP-Connectivity Network:** refers to any reference points in the architecture that provide IP connectivity between any two or more IP capable nodes; e.g. Gm, Gi, Mw. An example of an "IP-Connectivity Network" is GPRS.

**Subscriber:** A Subscriber is an entity (comprising one or more users) that is engaged in a Subscription with a service provider. The subscriber is allowed to subscribe and unsubscribe services, to register a user or a list of user authorised to enjoy these services, and also to set the limits relative to the use that users make of these services.

## next modified section

### 4.2.2 Support of Local Services in the IMS

[Editor's note: Local Services are not supported in Release 5 (decision from SA#15). However, in order not to create a Release 6 version of 23.228, the following text is kept in version 5 (to be deleted from version 5 as soon as a version 6 is created):

Visited network provided services offer an opportunity for revenue generation by allowing access to services of a local nature to visiting users (inbound roamers). There shall be a standardised means to access local services. The mechanism to access local services shall be exactly the same for home users and inbound roamers.

Access to local services shall be provided in the following manner

1. It shall be possible for the HPLMN to determine whether the roaming ~~subscriber~~ user is requesting a local service, or is "dialing" an address according to the local addressing plan. This shall be based upon an indication received from the UE. The same indication shall be used to access local services as well as to use the local addressing plan. This indication shall be included in the Request URI of the SIP Invite. 2. The P-CSCF shall route the session towards the S-CSCF as per the session origination procedures.

2. Processing the SIP URI (e.g. address analysis and potential modification such as translation into globally routable format) shall be performed by an Application Server in the subscriber's Home Network. The S-CSCF routes the session towards this Home Network Application Server based upon filter criteria which are triggered by the 'local indication' received from the UE.

3. The S-CSCF routes the session, via normal SIP routing, towards its destination (eg a server in the VPLMN). The ISC interface is not used as an inter-operator interface.

There shall be a standardised mechanism for the UE that is registered in the IM Subsystem, to receive and/or retrieve information about the available local services. It shall be possible to advertise local services to a registered UE independent of whether the UE has an active SIP session. Local services may be presented e.g. by directing the user to a web page.

Note: For users who have roamed, services relevant to the locality of the user may also be provided by the home network.

End of editor's note.]

next modified section

### ~~4.2.3 Support of roaming subscribers~~ 4.2.3 Support of roaming users

The architecture shall be based on the principle that the service control for Home subscribed services for a roaming ~~subscriber~~ user is in the Home network, e.g., the Serving-CSCF is located in the Home network.

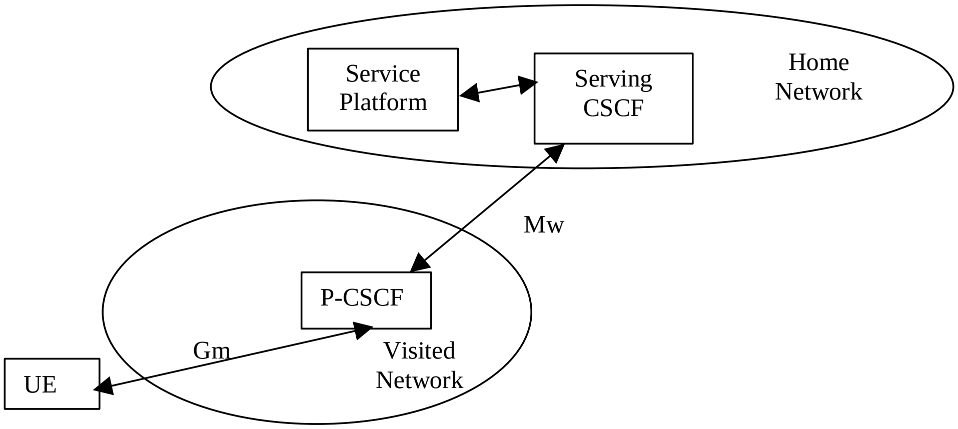


**Figure 4-1: Service Platform in Home Network**

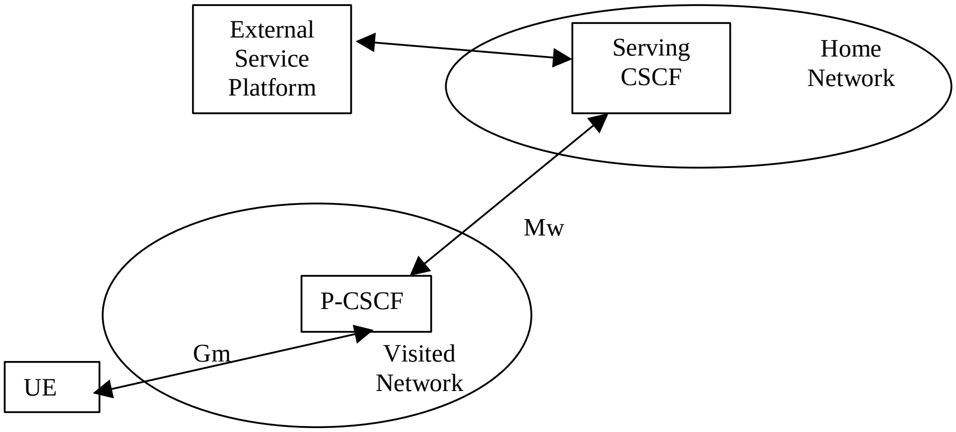


**Figure 4-2: External Service Platform**

There are two possible scenarios to provide services:

- via the service platform in the Home Network

- via an external service platform (e.g. third party or visited network)

The box representing the external service platform could be located in either the visited network or in the 3rd party platform. The standardised way for secure 3rd party access to IMS services is the OSA framework, see section 4.2.4.

The roles that the CSCF plays are described below.

- The Proxy-CSCF is located in the same network as the GGSN. The Proxy-CSCF shall enable the session control to be passed to the Serving-CSCF.

- The Serving-CSCF is located in the home network. The Serving-CSCF shall provide the service control.

A Proxy-CSCF shall be supported in both roaming and non-roaming case, even when the Serving-CSCF is located in the same IM CN SS.

Reassigning the Proxy-CSCF assigned during CSCF discovery is not a requirement in this release. Procedures to allow registration time Proxy-CSCF reassignment may be considered in future releases.

Network initiated Proxy-CSCF reassignment is not a requirement.

The use of additional CSCFs, that is Interrogating-CSCFs, to be included in the SIP signalling path is optional. Such additional CSCFs may be used to shield the internal structure of a network from other networks.

next modified section

## 4.2.4 IP multimedia Subsystem Service Control Interface (ISC)

The ISC interface is between the Serving CSCF and the service platform(s).

An Application Server (AS) offering value added IM services resides either in the user's home network or in a third party location. The third party could be a network or simply a stand-alone AS.

The Serving-CSCF to AS interface is used to provide services residing in an AS. Two cases were identified:

- Serving-CSCF to an AS in Home Network.

- Serving-CSCF to an AS in External Network (e.g., Third Party or Visited)

Regarding the general provision of services in the IMS, the following statements shall guide the further development.

1. Besides the Cx interface the S-CSCF supports only one standardised protocol for service control, which delegates service execution to an “Application Server”.

2. The depicted functional architecture does not propose a specific physical implementation.

3. Scope of the SIP Application Server: the SIP Application Server may host and execute services. It is intended to allow the SIP Application Server to influence and impact the SIP session on behalf of the services and it uses the ISC interface to communicate with the S-CSCF.

4. The S-CSCF shall decide whether an Application Server is required to receive information related to an incoming SIP session request to ensure appropriate service handling.. The decision at the S-CSCF is based on (filter) information received from the HSS (or other sources, e.g. application servers). This filter information is stored and conveyed on a per application server basis for each ~~subscriber~~user. The name(s)/address(es) information of the application server(s) are received from the HSS.

5. The purpose of the IM SSF is to host the CAMEL network features (i.e. trigger detection points, CAMEL Service Switching Finite State Machine, etc) and to interface to CAP.

6. The IM SSF and the CAP interface support legacy services only.

7. Once the IM SSF, OSA SCS or SIP Application Server has been informed of a SIP session request by the S-CSCF, the IM SSF, OSA SCS or SIP Application Server shall ensure that the S-CSCF is made aware of any resulting activity by sending messages to the S-CSCF.

8. From the perspective of the S-CSCF, The “SIP Application server”, “OSA service capability server” and “IM-SSF” shall exhibit the same interface behaviour.

9. The application server may contain “service capability interaction manager” (SCIM) functionality and other application servers. The SCIM functionality is an application which performs the role of interaction management. The internal components are represented by the “dotted boxes” inside the SIP application server. The internal structure of the application server is outside the standards.
The Sh interface shall have sufficient functionality to enable this scenario.

10. When the name/address of more than one “application server” is transferred from the HSS, the S-CSCF shall contact the “application servers” in the order supplied by the HSS. The response from the first “application server” shall be used as the input to the second “application server”. Note that these multiple “application servers” may be any combination of the SIP Application server, OSA service capability server, or IM-SSF types.

11. The S-CSCF does not handle service interaction issues..

12. The S-CSCF does not provide authentication and security functionality for secure direct third party access to the IM subsystem. The OSA framework provides a standardized way for third party secure access to the IM subsystem.

More specifically the following requirements apply to the IMS Service control interface:

1. The ISC interface shall be able to convey charging information.

2. The protocol on the ISC interface shall support the control of timers

3. The protocol on the ISC interface shall allow the S-CSCF to differentiate between session control on Mw, Mm and Mg interfaces and the ISC interface.

The figure below depicts an overall view of how services can be provided.

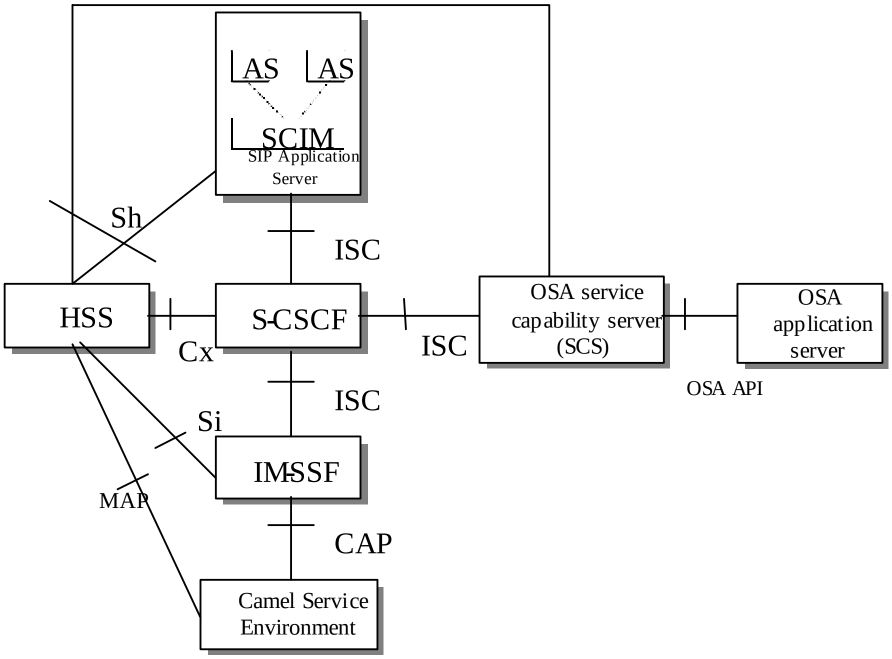


**Figure 4.3: Functional architecture for the provision of service in the IMS**

The protocol to be used on the ISC interface shall be SIP (as defined by RFC 3261 [12], other relevant RFC's, and additional enhancements introduced to support 3GPP´s needs on the Mw, Mm, Mg interfaces). On the ISC interface, extensions to SIP shall be avoided but are not expressly prohibited.

The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the Mw, Mm and Mg interfaces is sent on the ISC interface. The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the ISC interface is sent on the Mw, Mm and Mg interfaces.

Concerning the relationship between the SIP legs of the ISC interface and the SIP legs of the Mw, Mm, and Mg interfaces the S-CSCF acts as a SIP proxy, as shown in Figures 4.a-4e below.

Figures 4.3a-4.3e below depict the possible high-level interactions envisioned between the S-CSCF and the Application Server.

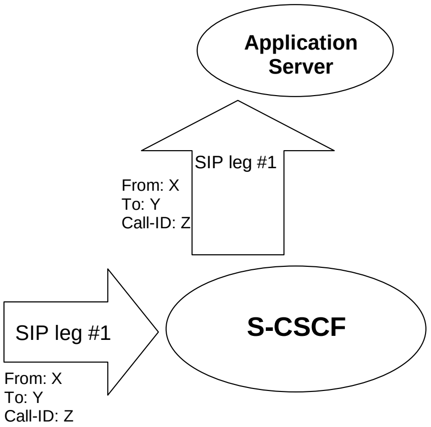


**Figure 4.3a: Application Server acting as terminating UA, or redirect server**

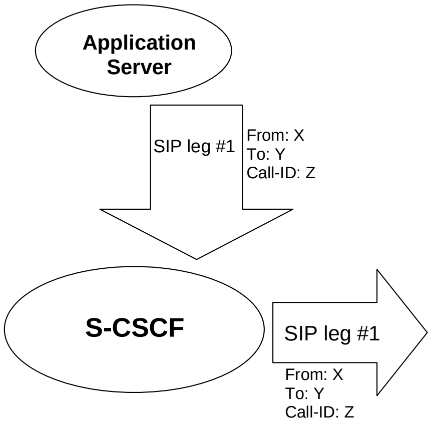


**Figure 4.3b: Application Server acting as originating UA**

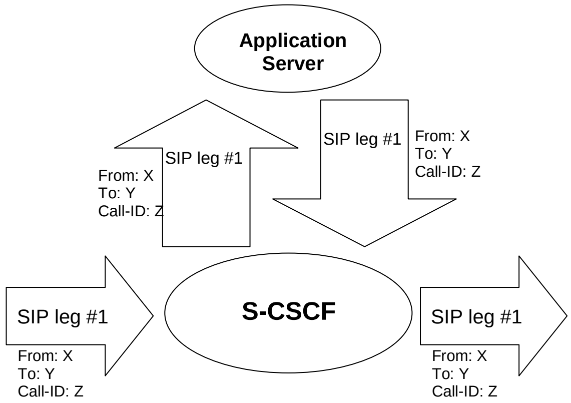


**Figure 4.3c: Application Server acting as a SIP proxy**

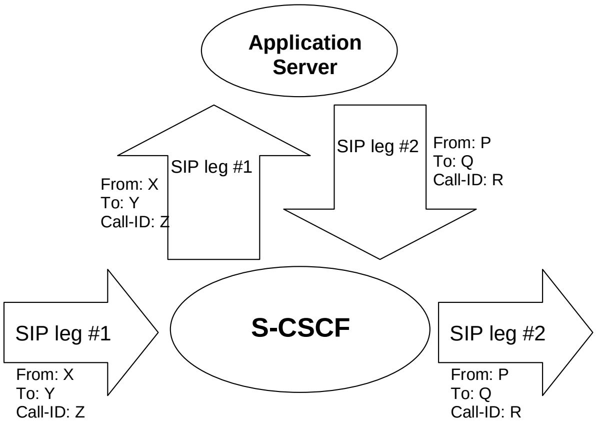


**Figure 4.3d: Application Server performing 3$^{rd}$ party call control**

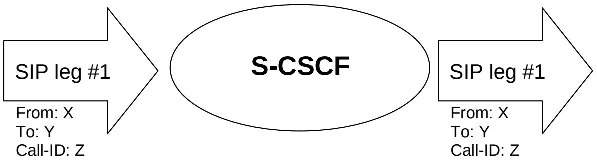


**Figure 4.3e: A SIP leg is passed through the S-CSCF without Application Server involvement**

next modified section

### 4.3.3 Identification of users

There are various identities that may be associated with a user of IP multimedia services. This section describes these identities and their use.

#### 4.3.3.1 Private user identities

Every IM CN subsystem ~~subscriber~~ user shall have a private user identity. The private identity is assigned by the home network operator, and used, for example, for Registration, Authorisation, Administration, and Accounting purposes. This identity shall take the form of a Network Access Identifier (NAI) as defined in RFC 2486 [14]. It is possible for a representation of the IMSI to be contained within the NAI for the private identity.

- The Private User Identity is not used for routing of SIP messages.
- The Private User Identity shall be contained in all Registration requests, (including Re-registration and De-registration requests) passed from the UE to the home network.
- An ISIM application shall securely store the Private User Identity. It shall not be possible for the UE to modify the UICC's Private User Identity information.
- The Private User Identity is a unique global identity defined by the Home Network Operator, which may be used within the home network to uniquely identify the user from a network perspective.
- The Private User Identity shall be permanently allocated to a user (it is not a dynamic identity), and is valid for the duration of the user's subscription with the home network.
- The Private User Identity is used to identify the user's information (for example authentication information) stored within the HSS (for use for example during Registration).
- The Private User Identity may be present in charging records based on operator policies.
- The Private User Identity identifies the subscription (e.g. IM service capability) not the user.
- The Private User Identity is authenticated only during registration of the ~~subscriber~~user, (including re-registration and de-registration).
- The HSS and S-CSCF need to obtain and store the Private User Identity.
- If the UICC does not contain an ISIM application, then the private user identity shall be derived from the USIM's IMSI, which allows for uniquely identifying the user within the 3GPP operator's network. The format of the private user identity derived from the IMSI is specified in 3GPP TS 23.003 [24].

#### 4.3.3.2 Public user identities

Every IM CN subsystem ~~subscriber~~ user shall have one or more public user identities [8]. The public user identity/identities are used by any user for requesting communications to other users. For example, this might be included on a business card.

- Both telecom numbering and Internet naming schemes can be used to address users depending on the Public User identities that the users have.
- The public user identity/identities shall take the form of SIP URL (as defined in RFC 3261 [12] and RFC2396 [13]) or the "tel:"-URL format [15]..
- An ISIM application shall securely store at least one Public User Identity (it shall not be possible for the UE to modify the Public User Identity), but it is not required that all additional Public User Identities be stored on the ISIM application.
- A Public User Identity shall be registered either explicitly or implicitly before the identity can be used to originate IMS sessions and IMS session unrelated procedures.
- A Public User Identity shall be registered either explicitly or implicitly before terminating IMS sessions and terminating IMS session unrelated procedures can be delivered to the UE of the user that the Public User Identity belongs to. Subscriber-specific services for unregistered users may nevertheless be executed as described in chapter 5.12.

- It shall be possible to register globally (i.e. through one single UE request) a ~~subscriber~~ user that has more than one public identity via a mechanism within the IP multimedia CN subsystem (e.g. by using an Implicit Registration Set). This shall not preclude the user from registering individually some of his/her public identities if needed.

- Public User Identitys are not authenticated by the network during registration.

- Public User Identities may be used to identify the user's information within the HSS (for example during mobile terminated session set-up).

  If the UICC does not contain an ISIM application, then:

- A Temporary Public User identity shall be derived from the USIM's IMSI, and shall be used during initial SIP registration procedures. The Temporary public user identity shall take the form of a SIP URL (as defined in RFC 3261 [12] and RFC 2396 [13]). The format of the Temporary public user identity is specified in 3GPP TS 23.003 [24].

- A Temporary public user identity shall not be displayed to the user and shall not be used for public usage such as displaying on a business card. It is strongly recommended that the Temporary Public User Identity is set to be barred. If the Temporary Public User Identity is barred:
  - the Temporary Public User Identity shall only be used during the registration to obtain implicitly registered Public User Identities.
  - the implicitly registered public user identities shall be used for session handling, in other SIP messages and at subsequent registration processes.

- After the initial registration, the UE shall only use the implicitly registered Public User Identity(s).

- A Temporary public user identity shall only be available to the CSCF and HSS nodes.

  Note that in case of Temporary Public Identity is used, the user can not initiate any sessions until the implicitly registered public identities are available in the UE.

### 4.3.3.3 Routing of SIP signalling within the IP multimedia subsystem

Routing of SIP signalling within the IMS shall use SIP URLs. E.164 [2] format public user identities shall not be used for routing within the IMS, and session requests based upon E.164 format public user identities will require conversion into SIP URL format for internal IMS usage.

### 4.3.3.4 Relationship of private and public user identities

The home network operator is responsible for the assignment of the private user identifier, and public user identifiers; other identities that are not defined by the operator may also exist.

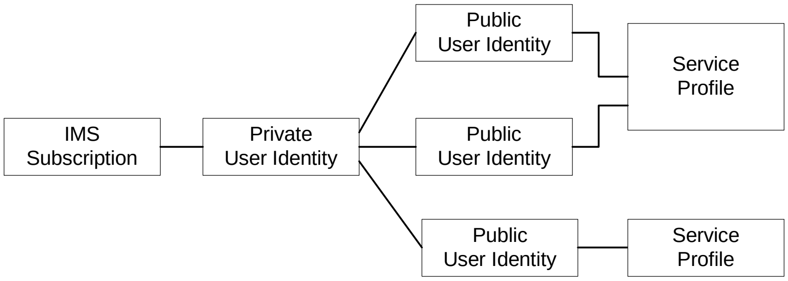


**Figure 4.5: Relationship of the private user identity and public user identities**

Each Public user identity is associated with one and only one Service Profile. Each service profile is associated with one or more Public user identities. The Service Profile is a collection of service and user related data. The Service Profile is independent from the Implicit Registration Set, e.g. IMPUs with different Service Profiles may belong to the same Implicit Registration Set.

All Service Profiles that share the same Private user identity are associated to the same S-CSCF. Later releases may allow different Service Profiles that share the same Private user identity to be associated with different S-CSCFs.

An ISIM application shall securely store the home domain name of the subscriber. It shall not be possible for the UE to modify the information from which the home domain name is derived.

If the UICC does not have an ISIM application, then, the home domain name shall be derived from the Mobile Country Code and Mobile Network Code fields of the USIM's IMSI. The format of the home domain name is specified in 3GPP TS 23.003 [24].

The storage location of the Private User Identity, Public User Identity and home domain name for a standalone SIP Client could be stored on the ISIM.

It is not a requirement for a user to be able to register on behalf of another user or for a device to be able to register on behalf of another device or for combinations of the above for the IM CN subsystem for this release.

next modified section

## 4.6.2 Interrogating-CSCF

Interrogating-CSCF (I-CSCF) is the contact point within an operator's network for all connections destined to a ~~subscriber~~ user of that network operator, or a roaming ~~subscriber~~ user currently located within that network operator's service area. There may be multiple I-CSCFs within an operator's network. The functions performed by the I-CSCF are:

Registration

- Assigning a S-CSCF to a user performing SIP registration (see section on Procedures related to Serving-CSCF assignment)

Session-related and session-unrelated flows

- Route a SIP request received from another network towards the S-CSCF.
- Obtain from HSS the Address of the S-CSCF.
- Forward the SIP request or response to the S-CSCF determined by the step above

Charging and resource utilisation:

- Generation of CDRs.

### 4.6.2.1 Topology Hiding Inter-network Gateway

In performing the above functions the operator may use a Topology Hiding Inter-network Gateway (THIG) function in the I-CSCF (referred to hereafter as I-CSCF(THIG)) or other techniques to hide the configuration, capacity, and topology of the network from the outside. When an I-CSCF(THIG) is chosen to meet the hiding requirement then for sessions traversing across different operators domains, the I-CSCF(THIG) may forward the SIP request or response to another I-CSCF(THIG) allowing the operators to maintain configuration independence.

next modified section

## 4.6.3 Serving-CSCF

The Serving-CSCF (S-CSCF) performs the session control services for the UE. It maintains a session state as needed by the network operator for support of the services. Within an operator's network, different S-CSCFs may have different functionalities. The functions performed by the S-CSCF during a session are:

Registration

- May behave as a Registrar as defined in RFC 3261 [12] or subsequent versions, i.e. it accepts registration requests and makes its information available through the location server (eg. HSS).

Session-related and session-unrelated flows

- Session control for the registered endpoint's sessions. It shall reject IMS communication to/from public user identity(s) that are barred for IMS communications after completion of registration, as described in subclause 5.2.1.
- May behave as a Proxy Server as defined in RFC 3261 [12] or subsequent versions, i.e. it accepts requests and services them internally or forwards them on, possibly after translation.
- May behave as a User Agent as defined in RFC 3261 [12] or subsequent versions, i.e. it may terminate and independently generate SIP transactions.
- Interaction with Services Platforms for the support of Services
- Provide endpoints with service event related information (e.g. notification of tones/announcement together with location of additional media resources, billing notification)
- On behalf of an originating endpoint (i.e. the originating ~~subscriber~~user/UE)
    - Obtain from a database the Address of the I-CSCF for the network operator serving the destination ~~subscriber~~ user from the destination name (e.g. dialled phone number or SIP URL), when the destination ~~subscriber~~ user is a customer of a different network operator, and forward the SIP request or response to that I-CSCF.
    - When the destination name of the destination ~~subscriber~~ user (e.g. dialled phone number or SIP URL), and the originating ~~subscriber~~ user is a customer of the same network operator, forward the SIP request or response to an I-CSCF within the operator's network.
    - Depending on operator policy, forward the SIP request or response to another SIP server located within an ISP domain outside of the IM CN subsystem.
    - Forward the SIP request or response to a BGCF for call routing to the PSTN or CS Domain.
- On behalf of a destination endpoint (i.e. the terminating ~~subscriber~~user/UE)
    - Forward the SIP request or response to a P-CSCF for a MT procedure to a home ~~subscriber~~ user within the home network, or for a ~~subscriber~~ user roaming within a visited network where the home network operator has chosen not to have an I-CSCF in the path
    - Forward the SIP request or response to an I-CSCF for a MT procedure for a roaming ~~subscriber~~ user within a visited network where the home network operator has chosen to have an I-CSCF in the path.
    - Modify the SIP request for routing an incoming session to CS domain according to HSS and service control interactions, in case the ~~subscriber~~ user is to receive the incoming session via the CS domain.
    - Forward the SIP request or response to a BGCF for call routing to the PSTN or the CS domain.

Charging and resource utilisation:

- Generation of CDRs.

next modified section

## 5.1.2 Procedures related to Serving-CSCF assignment

### ~~5.1.2.1 Assigning a Serving-CSCF for a subscriber~~5.1.2.1 Assigning a Serving-CSCF for a user

When a UE attaches and makes itself available for access to IMS services by explicitly registering in the IMS, a S-CSCF shall be assigned to serve the UE.

The assignment of an S-CSCF is performed in the I-CSCF. The following information is needed in the selection of the S-CSCF:

1. Required capabilities for ~~subscriber~~ user services
   This information is provided by the HSS.

2. Operator preference on a per-user basis
   This information is provided by the HSS.

3. Capabilities of individual S-CSCFs in the home network
   This is internal information within the operator's network. This information may be used in the S-CSCF selection. This information is obtained by the I-CSCF by methods not standardised in this release.

4. Topological (i.e. P-CSCF) information of where the ~~subscriber~~ user is located
   This is internal information within the operator's network. This information may be used in the S-CSCF selection. The P-CSCF name is received in the registration request. The topological information of the P-CSCF is obtained by the I-CSCF by methods not standardised in Release 5.

5. Topological information of where the S-CSCF is located
   This is internal information within the operator's network. This information may be used in the S-CSCF selection. This information is obtained by the I-CSCF by methods not standardised in this release.

6. Availability of S-CSCFs
   This is internal information within the operator's network. This information may be used in the S-CSCF selection. This information is obtained by the I-CSCF by methods not standardised in this release.

In order to support the S-CSCF selection described above, it is required that the following types of information be transferred between the CSCF and the HSS:

1 The Cx reference point shall support the transfer of CSCF-UE security parameters from HSS to CSCF.

- This allows the CSCF and the ~~subscriber~~ UE to communicate in a trusted and secure way (there is no à priori trust relationship between a ~~subscriber~~ UE and a CSCF)

- The security parameters can be for example pre-calculated challenge-response pairs, or keys for an authentication algorithm, etc.

2 The Cx reference point shall support the transfer of service parameters of the subscriber from HSS to CSCF.

- This may include e.g. supplementary service parameters, application server address, triggers etc.

3 The Cx reference point shall support the transfer of CSCF capability information from CSCF to HSS.

- This may include e.g. supported service set, protocol version numbers etc.

4 The Cx reference point shall support the transfer of session signalling transport parameters from CSCF to HSS. The HSS stores the signalling transport parameters and they are used for routing mobile terminated sessions to the Serving-CSCF.

- The parameters may include e.g. IP-address and port number of CSCF, transport protocol etc.

The information mentioned in items 1 – 4 above shall be transferred before the CSCF is able to serve the mobile ~~subscriber~~user. It shall also be possible to update this information while the CSCF is serving the ~~subscriber~~user, for example if new supplementary services are activated for the ~~subscriber~~user.

### 5.1.2.2 Cancelling the Serving-CSCF assignment

Cancellation of the assigned Serving CSCF is either:

- Initiated from the Serving CSCF itself, e.g. due to timeout of the registration
- Performed as a result of an explicit deactivation/de-registration from the IMS. This is triggered by the UE.
- Performed due to a request from the HSS over the Cx interface, e.g. due to changes in the subscription.

next modified section

## 5.2.2 Registration flows

### 5.2.2.1 Requirements to consider for registration

The additional requirement for the registration information flow for this section is:

1. A Serving-CSCF is assigned at registration, this does not preclude additional Serving-CSCFs or change of CSCF at a later date. Procedures for use of additional CSCFs are not standardised in this release.

### 5.2.2.2 Assumptions

The following are considered as assumptions for the registration procedures as described in subclause 5.3.2.3:

1. Radio bearers are already established for signalling and a mechanism exists for the first REGISTER message to be forwarded to the proxy.

2. The I-CSCF shall use a mechanism for determining the Serving-CSCF address based on the required capabilities. The I-CSCF obtains the name of the S-CSCF from its role as an S-CSCF selector (Figure 5-1) for the determination and allocation of the Serving-CSCF during registration.

3. The decision for selecting the S-CSCF for the ~~subscriber~~ user in the network is made in the I-CSCF.

4. A role of the I-CSCF is the S-CSCF selection.

In the information flows described in subclauses 5.2.2.3 and 5.2.2.4, there is a mechanism to resolve a name and address. The text in the information flows indicates when the name-address resolution mechanism is utilised. These flows do not take into account security features such as user authentication. The description of the impact of IMS security features is done in [19] 33.203.

### 5.2.2.3 Registration information flow – User not registered

The application level registration can be initiated after the registration to the access is performed, and after IP connectivity for the signalling has been gained from the access network. For the purpose of the registration information flows, the ~~subscriber~~ user is considered to be always roaming. For ~~subscribers~~ user roaming in their home network, the home network shall perform the role of the visited network elements and the home network elements.

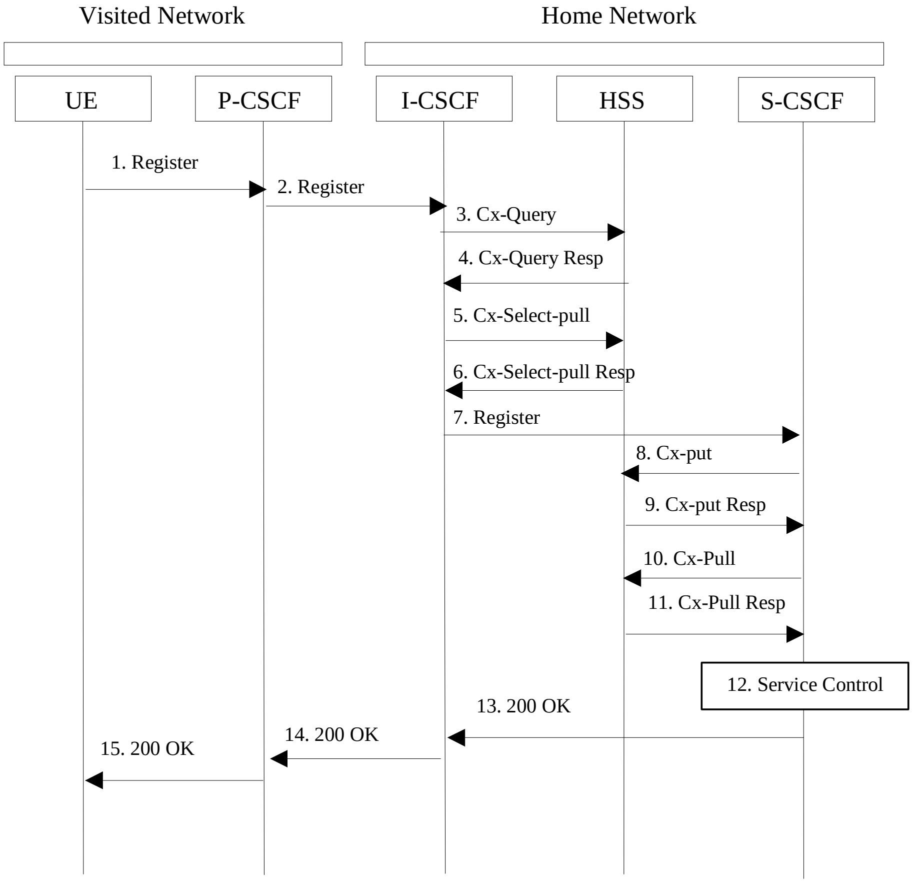


**Figure 5.1: Registration – User not registered**

1. After the UE has obtained a signalling channel through the access network, it can perform the IM registration. To do so, the UE sends the Register information flow to the proxy (public user identity, private user identity, home network domain name, UE IP address).

2. Upon receipt of the register information flow, the P-CSCF shall examine the “home domain name” to discover the entry point to the home network (i.e. the I-CSCF). The proxy shall send the Register information flow to the I-CSCF (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address). A name-address resolution mechanism is utilised in order to determine the address of the home network from the home domain name. The P-CSCF network identifier is a string that identifies at the home network, the network where the P-CSCF is located (e.g., the P-CSCF network identifier may be the domain name of the P-CSCF network).

3. The I-CSCF shall send the Cx-Query information flow to the HSS (public user identity, private user identity, P-CSCF network identifier).

   The HSS shall check whether the user is registered already. The HSS shall indicate whether the user is allowed to register in that P-CSCF network (identified by the P-CSCF network identifier) according to the User subscription and operator limitations/restrictions if any.

4. Cx-Query Resp is sent from the HSS to the I-CSCF it shall contain the S-CSCF name, if it is known by the HSS. If the checking in HSS was not successful the Cx-Query Resp shall reject the registration attempt.

5. If the I-CSCF has not been provided with the name of the S-CSCF then the I-CSCF shall send Cx-Select-Pull (public user identity, private user identity) to the HSS to request the information related to the required S-CSCF capabilities which shall be input into the S-CSCF selection function.

6. The HSS shall send Cx-Select-Pull Resp (required S-CSCF capabilities) to the I-CSCF.

7. The I-CSCF, using the name of the S-CSCF, shall determine the address of the S-CSCF through a name-address resolution mechanism. The I-CSCF also determines the name of a suitable home network contact point, possibly based on information received from the HSS. The home network contact point may either be the S-CSCF itself,

or a suitable I-CSCF(THIG) in case network configuration hiding is desired. If an I-CSCF(THIG) is chosen as the home network contact point for implementing network configuration hiding, it may be distinct from the I-CSCF that appears in this registration flow, and it shall be capable of deriving the S-CSCF name from the home contact information. I-CSCF shall then send the register information flow (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address, I-CSCF(THIG) in case network configuration hiding is desired) to the selected S-CSCF. The home network contact point will be used by the P-CSCF to forward session initiation signalling to the home network.

8. The S-CSCF shall send Cx-Put (public user identity, private user identity, S-CSCF name) to the HSS. The HSS stores the S-CSCF name for that ~~subscriber~~user.

9. The HSS shall send Cx-Put Resp to the I-CSCF to acknowledge the sending of Cx-Put.

10. On receipt of the Cx-Put Resp information flow, the S-CSCF shall send the Cx-Pull information flow (public user identity, private user identity) to the HSS in order to be able to download the relevant information from the ~~subscriber~~ user profile to the S-CSCF. The S-CSCF shall store the P-CSCF address/name, as supplied by the visited network. This represents the address/name that the home network forwards the subsequent terminating session signalling to for the UE.

11. The HSS shall return the information flow Cx-Pull Resp (user information) to the S-CSCF. The user information passed from the HSS to the S-CSCF shall include one or more names/addresses information which can be used to access the platform(s) used for service control while the user is registered at this S-CSCF. The S-CSCF shall store the information for the indicated user. In addition to the names/addresses information, security information may also be sent for use within the S-CSCF.

12. Based on the filter criteria, the S-CSCF shall send register information to the service control platform and perform whatever service control procedures are appropriate.

13. The S-CSCF shall return the 200 OK information flow (home network contact information) to the I-CSCF. If an I-CSCF is chosen as the home network contact point for implementing network configuration hiding, the I-CSCF shall encrypt the S-CSCF address in the home network contact information.

14. The I-CSCF shall send information flow 200 OK (home network contact information) to the P-CSCF. The I-CSCF shall release all registration information after sending information flow 200 OK.

15. The P-CSCF shall store the home network contact information, and shall send information flow 200 OK to the UE.

Note: The encryption mechanism for implementing network configuration hiding is specified in TS 33.203.

### 5.2.2.4 Re-Registration information flow – User currently registered

Periodic application level re-registration is initiated by the UE either to refresh an existing registration or in response to a change in the registration status of the UE. Re-registration follows the same process as defined in subclause 5.2.2.3 “Registration Information Flow – User not registered”. When initiated by the UE, based on the registration time established during the previous registration, the UE shall keep a timer shorter than the registration related timer in the network.

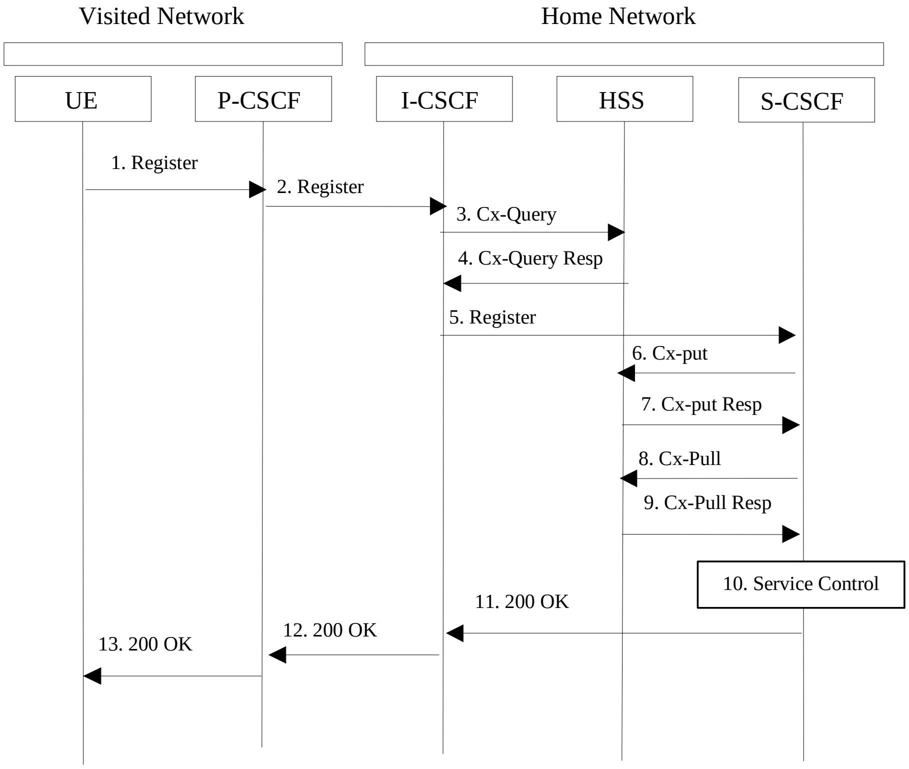


**Figure 5.2: Re-registration - user currently registered**

1. Prior to expiry of the agreed registration timer, the UE initiates a re-registration. To re-register, the UE sends a new REGISTER request. The UE sends the REGISTER information flow to the proxy (public user identity, private user identity, home network domain name, UE IP address).

2. Upon receipt of the register information flow, the P-CSCF shall examine the “home domain name” to discover the entry point to the home network (i.e. the I-CSCF). The proxy does not use the entry point cached from prior registrations. The proxy shall send the Register information flow to the I-CSCF (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address). A name-address resolution mechanism is utilised in order to determine the address of the home network from the home domain name. The P-CSCF network identifier is a string that identifies at the home network, the network where the P-CSCF is located (e.g., the P-CSCF network identifier may be the domain name of the P-CSCF network).

3. The I-CSCF shall send the Cx-Query information flow to the HSS (public user identity, private user identity and P-CSCF network identifier).

4. The HSS shall check whether the user is registered already and return an indication indicating that an S-CSCF is assigned. The Cx-Query Resp (indication of entry contact point, e.g. S-CSCF) is sent from the HSS to the I-CSCF.

5. The I-CSCF, using the name of the S-CSCF, shall determine the address of the S-CSCF through a name-address resolution mechanism. The I-CSCF also determines the name of a suitable home network contact point, possibly based on information received from the HSS. The home network contact point may either be the S-CSCF itself, or a suitable I-CSCF(THIG) in case network configuration hiding is desired. If an I-CSCF(THIG) is chosen as the home network contact point for implementing network configuration hiding, it may be distinct from the I-CSCF that appears in this registration flow, and it shall be capable of deriving the S-CSCF name from the home contact information. I-CSCF shall then send the register information flow (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address, I-CSCF(THIG) in case network configuration hiding is desired) to the selected S-CSCF. The home network contact point will be used by the P-CSCF to forward session initiation signalling to the home network.

6. The S-CSCF shall send Cx-Put (public user identity, private user identity, S-CSCF name) to the HSS. The HSS stores the S-CSCF name for that ~~subscriber~~user. Note: Optionally as an optimisation, the S-CSCF can detect that this is a re-registration and omit the Cx-Put request.

7. The HSS shall send Cx-Put Resp to the S-CSCF to acknowledge the sending of Cx-Put.

8. On receipt of the Cx-Put Resp information flow, the S-CSCF shall send the Cx-Pull information flow (public user identity, private user identity) to the HSS in order to be able to download the relevant information from the ~~subscriber~~ user profile to the S-CSCF. The S-CSCF shall store the P-CSCF address/name, as supplied by the visited network. This represents the address/name that the home network forwards the subsequent terminating session signalling to for the UE. Note: Optionally as an optimisation, the S-CSCF can detect that this a re-registration and omit the Cx-Pull request.

9. The HSS shall return the information flow Cx-Pull-Resp (user information) to the S-CSCF. The S-CSCF shall store the user information for that indicated user.

10. Based on the filter criteria, the S-CSCF shall send re-registration information to the service control platform and perform whatever service control procedures are appropriate.

11. The S-CSCF shall return the 200 OK information flow (home network contact information) to the I-CSCF. If an I-CSCF is chosen as the home network contact point for implementing network configuration hiding, the I-CSCF shall encrypt the S-CSCF address in the home network contact information.

12. The I-CSCF shall send information flow 200 OK (home network contact information) to the P-CSCF. The I-CSCF shall release all registration information after sending information flow 200 OK.

13. The P-CSCF shall store the home network contact information, and shall send information flow 200 OK to the UE.

Note: The encryption mechanism for implementing network configuration hiding is specified in TS 33.203.

### 5.2.2.5 Stored information.

Table 5.1 provides an indication of the information stored in the indicated nodes during and after the registration process.

**Table 5.1 Information Storage before, during and after the registration process**

| Node | Before Registration | During Registration | After Registration |
|---|---|---|---|
| UE - in local network | Credentials<br>Home Domain<br>Proxy Name/Address | Same as before registration | Credentials<br>Home Domain<br>Proxy Name/Address<br>Same as before registration |
| Proxy-CSCF<br>- in local network | Routing Function | Initial Network Entry point<br>UE Address<br>Public and Private User IDs | Final Network Entry point<br>UE Address<br>Public and Private User IDs |
| Interrogating-CSCF - in Home network | HSS or SLF Address | Serving-CSCF address/name<br>P-CSCF Network ID<br>Home Network contact Information | No State Information |
| HSS | User Service Profile | P-CSCF Network ID | Serving-CSCF address/name\ |
| Serving-CSCF (Home) | No state information | HSS Address/name<br>~~Subscriber~~ User profile (limited – as per network scenario)<br>Proxy address/name<br>P-CSCF Network ID<br>Public/Private User ID<br>UE IP Address | May have session state Information<br>Same as during registration |

next modified section

## 5.3.1 Mobile initiated de-registration

When the UE wants to de-register from the IMS then the UE shall perform application level de-registration. De-registration is accomplished by a registration with an expiration time of zero seconds. De-registration follows the same path as defined in subclause 5.2.2.3 “Registration Information Flow – User not registered”.

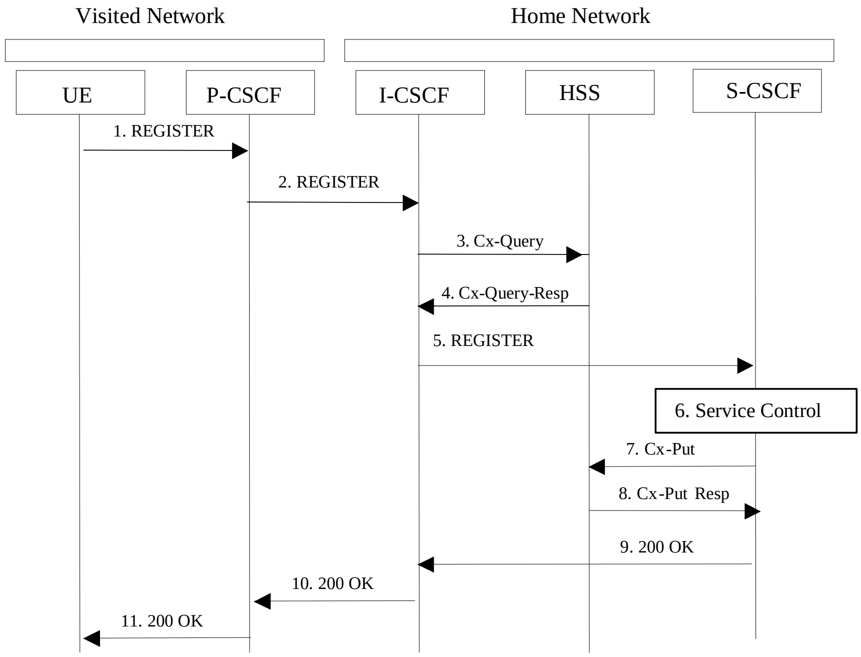


**Figure 5.3: De-registration - user currently registered**

1. The UE decides to initiate de-registration. To de-register, the UE sends a new REGISTER request with an expiration value of zero seconds. The UE sends the REGISTER information flow to the proxy (public user identity, private user identity, home network domain name, UE IP address).

2. Upon receipt of the register information flow, it shall examine the “home domain name” to discover the entry point to the home network (i.e. the I-CSCF). The proxy does not use the entry point cached from prior registrations. The proxy shall send the Register information flow to the I-CSCF (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address). A name-address resolution mechanism is utilised in order to determine the address of the home network from the home domain name. The P-CSCF network identifier is a string that identifies at the home network, the network where the P-CSCF is located (e.g., the P-CSCF network identifier may be the domain name of the P-CSCF network).

3. The I-CSCF shall send the Cx-Query information flow to the HSS (public user identity, private user identity, P-CSCF network identifier).

4. The HSS shall determine that the public user identity is currently registered. The Cx-Query Resp (indication of entry point, e.g. S-CSCF) is sent from the HSS to the I-CSCF.

5. The I-CSCF, using the name of the S-CSCF, shall determine the address of the S-CSCF through a name-address resolution mechanism and then shall send the de-register information flow (P-CSCF addres/name,  public user identity, private user identity, UE IP address, I-CSCF(THIG) in case network configuration hiding is desired) to the S-CSCF.

6. Based on the filter criteria, the S-CSCF shall send de-registration information to the service control platform and perform whatever service control procedures are appropriate. Service control platform removes all subscription information related to this specific ~~subscriber~~public user identity.

7. Based on operator choice the S-CSCF can send either Cx-Put (public user identity, private user identity, clear S-CSCF name) or Cx-Put (public user identity, private user identity, keep S-CSCF name), and the ~~subscriber~~

public user identity is no longer considered registered in the S-CSCF. The HSS then either clears or keeps the S-CSCF name for that public user identity~~subscriber~~ according to request. In both cases the state of the ~~subscriber~~ public user identity~~identity~~ is stored as unregistered in the HSS. If the S-CSCF name is kept, then the HSS shall be able to clear the serving S-CSCF at any time.

8. The HSS shall send Cx-Put Resp to the S-CSCF to acknowledge the sending of Cx-Put.

9. The S-CSCF shall return the 200 OK information flow to the I-CSCF. The S-CSCF may release all registration information regarding this specific registration of the ~~subscriber~~ public user identity after sending information flow 200 OK.

10. The I-CSCF shall send information flow 200 OK to the P-CSCF.

11. The P-CSCF shall send information flow 200 OK to the UE. The P-CSCF releases all registration information regarding this specific registration of the ~~subscriber~~ public user identity after sending information flow 200 OK.

next modified section

### 5.3.2 Network initiated de-registration

If an ungraceful session termination occurs (e.g. flat battery or mobile leaves coverage), when a stateful proxy server (such as the S-CSCF) is involved in a session, memory leaks and eventually server failure can occur due to hanging state machines. To ensure stable S-CSCF operation and carrier grade service, a mechanism to handle the ungraceful session termination issue is required. This mechanism should be at the SIP protocol level in order to guarantee access independence for the IM CN subsystem.

The IM CN subsystem can initiate a Network Initiated De-Registration procedures for the following reasons:

- Network Maintenance.
  Forced re-registrations from ~~subscribers~~users, e.g. in case of data inconsistency at node failure, in case of SIM lost, etc. Cancelling the current contexts of the user spread among the IM CN Subsystem network nodes at registration, and imposing a new IM registration solves this condition.

- Network/traffic determined.
  The IM CN subsystem must support a mechanism to avoid duplicate registrations or inconsistent information storage. This case will occur when a ~~subscriber~~ user roams to a different network without de-registering the previous one. This case may occur at the change of the roaming agreement parameters between two operators, imposing new service conditions to roamers.

- Application Layer determined.
  The service capability offered by the IM CN Subsystem to the Application Layers may have parameters specifying whether all IM CN subsystem registrations are to be removed, or only those from one or a group of terminals from the user, etc.

- Subscription Management
  The operator must be able to restrict user access to the IM CN subsystem upon detection of contract expiration, removal of IM subscription, fraud detection, etc.In case of changes in service profile of the user, e.g. the user subscribes to new services, it may possible that new S-CSCF capabilities, which are required from the S-CSCF, are not supported by the current S-CSCF which has been assigned to the user. In this case, it shall be possible to actively change the S-CSCF by using the network initiated de-registration by HSS procedure.

The following sections provide scenarios showing SIP application de-registration. Note that these flows have avoided the strict use of specific SIP protocol message names. This is in an attempt to focus on the architectural aspects rather than the protocol.

Two types of network-initiated de-registration procedures are required:

- To deal with registrations expirations.

- To allow the network to force de-registrations following any of the approved possible causes for this to occur.

### 5.3.2.1 Network Initiated Application (SIP) De-registration, Registration Timeout

The following flow shows a network initiated IM CN subsystem terminal application (SIP) de-registration based on a registration timeout. A timer value is provided at initial registration and is refreshed by subsequent re-registrations. The flow assumes that the timer has expired. The locations (home or visited network) of the P-CSCF and S-CSCF are not indicated as the scenario remains the same for all cases.

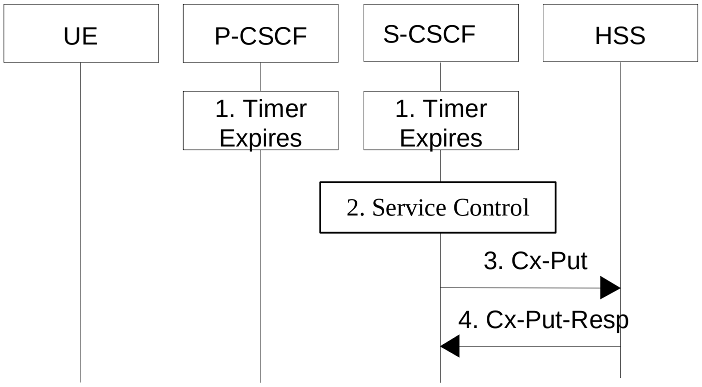


**Figure 5.4: Network initiated application de-registration, registration timeout**

1. The registration timers in the P-CSCF and in the S-CSCF expire. The timers are assumed to be close enough that no external synchronisation is required. The P-CSCF updates its internal databases to remove the ~~subscriber~~ public user identity from being registered. It is assumed that any GPRS PDP context cleanup will be handled by independent means.

2. Based on the filter criteria, the S-CSCF shall send de-registration information to the service control platform and perform whatever service control procedures are appropriate. Service control platform removes all subscription information related to this specific ~~subscriber~~public user identity.

3. Based on operator choice the S-CSCF can send either Cx-Put (public user identity, private user identity, clear S-CSCF name) or Cx-Put (public user identity, private user identity, keep S-CSCF name), and the public user identity~~subscriber~~ is no longer considered registered in the S-CSCF. The HSS then either clears or keeps S-CSCF name for that public user identity~~subscriber~~ according to the request. In both cases the state of the ~~subscriber identity~~public user identity is stored as unregistered in the HSS. If the S-CSCF name is kept, then the HSS shall be able to clear the serving S-CSCF at any time.

4. The HSS shall send Cx-Put Resp to the S-CSCF to acknowledge the sending of Cx-Put.

### 5.3.2.2 Network Initiated Application (SIP) De-registration, Administrative

For different reasons (e.g., subscription termination, lost terminal, etc.) a home network administrative function may determine a need to clear a user's SIP registration. This function initiates the de-registration procedure and may reside in various elements depending on the exact reason for initiating the de-registration.

One such home network element is the HSS, which already knows the S-CSCF serving the user and that for this purpose makes use of the Cx-Deregister. Another home network element that could initiate the de-registration is the S-CSCF, in which case it makes use of the Cx-Put to inform the HSS. Other trusted/secured parties may also initiate de-registration to the S-CSCF.

The following flow shows a network initiated IM CN subsystem terminal application (SIP) de-registration based on an administrative action for example. The IP transport infrastructure (e.g., GGSN, SGSN) is not notified. If complete packet access is to be denied, a transport layer administrative mechanism would be used. This scenario does not address the administrative mechanisms used for updating any subscriber records, EIR records, access authorisation, etc. This scenario only addresses the specific action of clearing the SIP application registration that is currently in effect.

As determined by the operator, on-going sessions may be released by using network initiated session release procedures in Section 5.10.3.

#### 5.3.2.2.1 Network Initiated De-registration by HSS, administrative

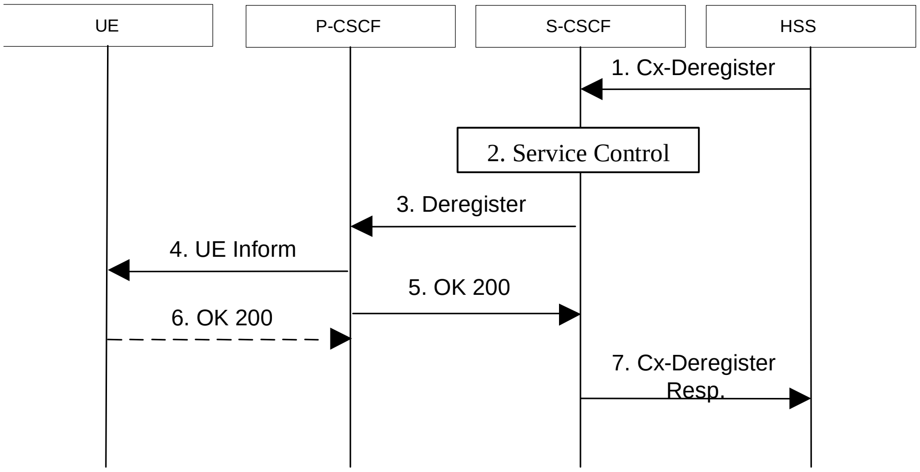


**Figure 5.5: Network initiated application de-registration by HSS, administrative**

1. HSS initiates the de-registration, sending a Cx-Deregister (~~subscriber~~ user identity) which may include the reason for the de-registration.
2. Based on the filter criteria, the S-CSCF shall send de-registration information to the service control platform and perform whatever service control procedures are appropriate.
3. The S-CSCF issues a de-registration towards the P-CSCF for this ~~UE~~ user and updates its internal database to remove the ~~UE~~ user from being registered. The reason for the de-registration received from the HSS shall be included if available.
4. The P-CSCF informs the UE of the de-registration and without modification forwards the reason for the de-registration, if available. Due to loss of contact with the mobile, it might be possible that the UE does not receive the information of the de-registration.
5. The P-CSCF sends a response to the S-CSCF and updates its internal database to remove the ~~UE~~ user from being registered.
6. When possible, the UE sends a response to the P-CSCF to acknowledge the de-registration. A misbehaving UE or a UE that is out of P-CSCF coverage could not answer properly to the de-registration request. The P-CSCF should perform the de-registration in any case, e.g., after the timer for this request expires.

If the UE does not perform automatic re-registration due to the de-registration the user shall be informed about the de-registration and of the reason, if available.

Note: Steps 4 and 5 may be done in parallel: the P-CSCF does not wait for an answer from the UE before answering to the S-CSCF

7. The S-CSCF returns a response to the entity that initiated the process.

Note: Another trusted/secured party may also request for de-registration via HSS through administrative mechanisms provided by the operator.

#### 5.3.2.2.2 Network Initiated De-registration by S-CSCF

A service platform may determine a need to clear a user's SIP registration. This function initiates the de-registration procedure and resides in a service platform.

The following flow shows a service control initiated IMS terminal application (SIP) de-registration. The IP transport infrastructure (e.g., GGSN, SGSN) is not notified. If complete packet access is to be denied, a transport layer administrative mechanism would be used. This scenario does not address the administrative mechanisms used for updating any subscriber records, EIR records, access authorisation, etc. This scenario only addresses the specific action of clearing the SIP application registration that is currently in effect.

As determined by the operator, on-going sessions may be released by using network initiated session release procedures in Section 5.10.3.

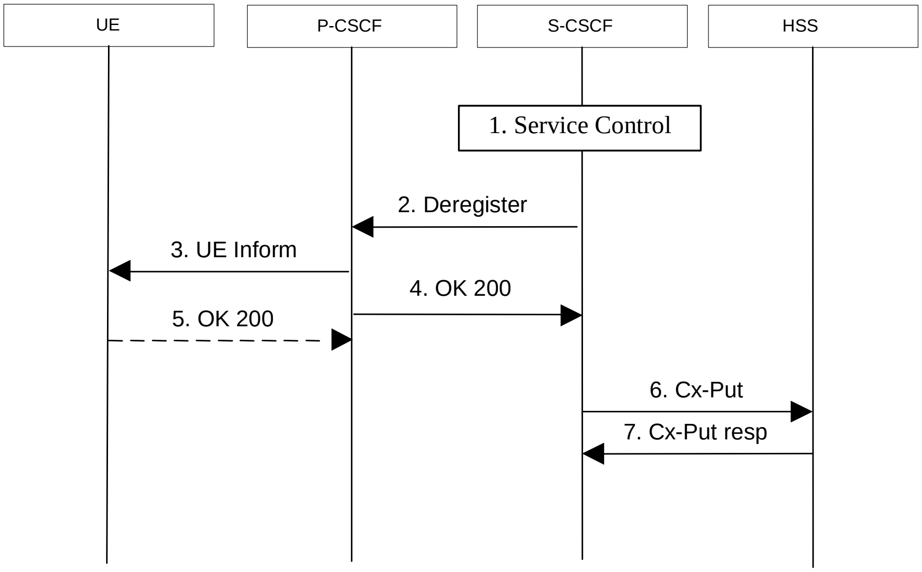


**Figure 5.5a: Network initiated application de-registration, service platform**

1. The S-CSCF receives de-registration information from the service platform and performs whatever service control procedures are appropriate. This information may include the reason for the de-registration.
2. The S-CSCF issues a de-registration towards the P-CSCF for this ~~UE~~ user and updates its internal database to remove the ~~UE~~ user from being registered. The reason for the de-registration shall be included, if available.
3. The P-CSCF informs the UE of the de-registration, and without modification forwards the reason for the de-registration, if available. Due to loss of contact with the mobile, it might be possible that the UE does not receive the information of the de registration.
4. The P-CSCF sends a response to the S-CSCF and updates its internal database to remove the ~~UE~~ user from being registered.
5. When possible, the UE sends a response to the P-CSCF to acknowledge the de-registration. A misbehaving UE or a UE that is out of P-CSCF coverage could not answer properly to the de-registration request. The P-CSCF should perform the de-registration in any case, e.g., after the timer for this request expires.

   If the UE does not perform automatic re-registration due to the de-registration the user shall be informed about the de-registration and of the reason, if available.

Note: Steps 4 and 5 may be done in parallel: the P-CSCF does not wait for an answer from the UE before answering to the S-CSCF

6. The S-CSCF sends an update to the HSS to remove itself as the registered S-CSCF for this user~~UE~~.
7. The HSS confirms the update.

Note: Another trusted/secured party may also initiate the de-registration, for example, by issuing a third party SIP registration with timer set to 0 via S-CSCF.

next modified section

## 5.4 Procedures for IP multi-media sessions

Basic sessions between mobile ~~subscribers~~ users will always involve two S-CSCFs (one S-CSCF for each). A basic session between a ~~subscriber~~ user and a PSTN endpoint involves an S-CSCF for the UE, a BGCF to select the PSTN gateway, and an MGCF for the PSTN.

The session flow is decomposed into three parts – an origination part, an inter-Serving-CSCF/ MGCF part, and a termination part. The origination part covers all network elements between the UE (or PSTN) and the S-CSCF for that UE (or MGCF serving the MGW). The termination part covers all network elements between the S-CSCF for the UE (or MGCF serving the MGW) and the UE (or PSTN).

### 5.4.1 Bearer interworking concepts

Voice bearers from the IM CN subsystem need to be connected with the voice bearers of other networks. Elements such as Media Gateway Functions (MGW) are provided to support such bearer interworking. One of the functions of the MGW may be to support transcoding between a codec used by the UE in the IM CN subsystem and the codec being used in the network of the other party.

Default codecs to be supported within the UE are defined in [21]. The use of default codecs within the UE enables the IM CN subsystem to interwork with other networks on an end to end basis or through transcoding.

The IM CN subsystem is also able to interwork with the CS networks (e.g. PSTN, ISDN, CS domain of some PLMN) by supporting AMR to G.711 [17] transcoding in the IMS MGW element. Furthermore to allow interworking between users of the IM CN subsystem and IP multimedia fixed terminals and other codecs may (this is implementation dependent) be supported by the MGW.

In order to support existing network capabilities, it is required that a UE be able to send DTMF tone indications to the terminating end of a session via the IMS. This can be done using SIP information. An additional element for bearer interworking is the interworking of these DTMF tones between one network and another. This may involve the generation of tones on the bearer of one network based on out of band signaling on the other network. In such a case, the MGW shall provide the tone generation under the control of the MGCF.

### 5.4.2 Interworking with Internet

Depending on operator policy, the S-CSCF may forward the SIP request or response to another SIP server located within an ISP domain outside of the IM CN subsystem.

### 5.4.3 Interworking with PSTN

The S-CSCF, possibly in conjunction with an application server, shall determine that the session should be forwarded to the PSTN. The S-CSCF will forward the Invite information flow to the BGCF in the same network.

The BGCF selects the network in which the interworking should occur, and the selection of the interworking network is based on local policy.

If the BGCF determines that the interworking should occur in the same network, then the BGCF selects the MGCF which will perform the interworking, otherwise the BGCF forward the invite information flow to the BGCF in the selected network.

The MGCF will perform the interworking to the PSTN and control the MG for the media conversions.

The high level overview of the network initiated PSTN interworking process is shown in figure 5.6.

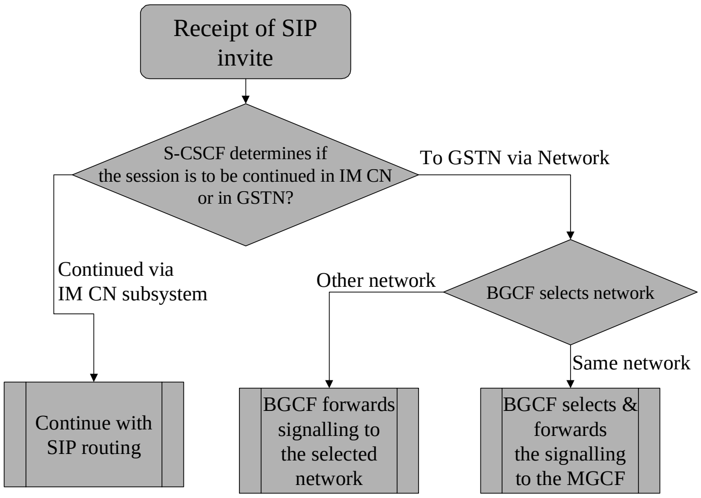

Receipt of SIP invite
S-CSCF determines if the session is to be continued in IM CN or in GSTN?
To GSTN via Network
Continued via IM CN subsystem
Other network
BGCF selects network
Same network
Continue with SIP routing
BGCF forwards signalling to the selected network
BGCF selects & forwards the signalling to the MGCF

**Figure 5.6: Network based PSTN interworking breakout process**

### 5.4.4 Requirements for IP multi-media session control

In order for operators to be able to offer a “carrier-grade” IP multimedia service, and considering that the network cannot trust the UE to give correct references to be put in the CDR or to require bearers whose features (e.g. Bandwidth) are coherent with the media components negotiated through CSCFs, the following features shall be offered:

1. Both end points of the session shall be able to negotiate (according to service /UE settings,) which resources (i.e. which media components) need to be established before the destination party is alerted. The session signalling shall ensure that these resources (including (UMTS) IP-Connectivity Network resources and IP multimedia backbone resources) are made available or reserved before the destination UE rings.

   This should nevertheless not prevent the UE from offering to the end-user the choice of accepting or rejecting the components of the session before establishing the bearers.

2. Depending on regulatory requirements, the IP multimedia service shall be able to charge the originating party for the Access IP-connectivity service of both originating and destination side or when reverse charging applies to charge the terminating party for the Access IP-connectivity service of both originating and terminating side. This implies that it should be easy to correlate CDR held by Access IP-connectivity service (e.g. GPRS) with a session.

3. The session control function of IP multimedia network of an operator (CSCF) shall be able (according to operator choice) to have a strict control (e.g. on source /destination IP address, QoS) on the flows associated with session established through SIP entering the IP multimedia bearer network from Access IP-connectivity service. This does not mean that CSCF is the enforcement point (which actually is the Gateway between the Access IP-connectivity service and the IP multimedia network, i.e. the GGSN in UMTS case) but that the CSCF may be the final decision point for this control.

4. The session control and bearer control mechanisms shall allow the session control to decide when user plane traffic between end-points of a SIP session may start/shall stop. This allows this traffic to start/stop in synchronisation with the start/stop of charging for a session.

5. The Access IP-connectivity service shall be able to notify the IP multimedia session control when Access IP-connectivity service has either modified or suspended or released the bearer(s) of an user associated with a session (because e.g. the user is no longer reachable).

6. The solution shall comply with the architectural rules relating to separation of bearer level, session control level, and service level expressed in 23.221[7].

### 5.4.5 Storing of session path information

There is a need to store the session path that is determined during the session initiation request in order to route the subsequent session requests through this determined path. This is needed in order to route these session requests through certain nodes, e.g. the ones performing Service Control. CSCFs are assumed to perform certain actions:

1. CSCFs (Proxy and Serving) store a certain part of the session path determined during session initiation. This allows CSCFs to generate requests that traverse all elements on a Route path.

2. P-CSCF will remove the network generated contents of the Via and Record-Route headers of the SIP requests to be sent to the UE. This increases security and reduces SIP message sizes and thus transmission delay over the air interface.

### 5.4.6 End-user preferences and terminal capabilities

Due to different capabilities of the originating and terminating terminals, it might not be possible to establish all the media suggested by the originator for a particular session. In addition, the destination user may have different preferences of type of media depending on who is originating and on the situation e.g. being in a meeting or driving the car etc.

#### 5.4.6.1 Objectives

The general objectives concerning terminal capabilities and end-user behaviour are listed below.

- The capabilities of the terminal have impact on the SDP description in the SIP session flows, since different terminals may support different media types (such as video, audio, application or data) and may have implemented different set of codecs for audio and video. Note that the capabilities of the terminal may change when an external device, such as a video camera is attached to the terminal.

- The configuration of the terminal changes the capabilities of the terminal. This can be done by attaching external devices or possibly by a user setting of certain parameters or profiles in the terminal.

- The preferences of the destination user may depend on who is originating the session and on the situation. Cost, associated with the session, may also be another factor, i.e. depending on time of the day or day of the week etc. Due to this reason the user may want to accept or reject certain media components.

- The available resources in the network play an important role, as certain media streams, consuming high bandwidth, may be denied. Therefore, before the user is alerted that the session set up is successful, it is assumed that the network has guaranteed and has reserved the needed resources for one or several media streams of the session. This does not preclude the possibility for the user to indicate his/her preferences regarding the session also after the alerting, in which case the initial resource reservations may have to be modified.

- End-to-end quality of service may be provided by using a variety of mechanisms, including guaranteed end-to-end QoS and best effort. The network may not be able to guarantee the requested end-to-end QoS. This may be the case when the user is establishing sessions through the public Internet. On the other hand, certain sessions, with the agreement of the initiating and terminating endpoints, should have the right to go through even without having the requested QoS guarantee.

#### 5.4.6.2 End-user expectations

From the end-user point of view the following user interactions can be listed:

- For outgoing sessions, it is assumed that the user would like to select certain parameters that define the proposed session. This can be pre-configured as preferences or defined on a per session basis.

- For incoming sessions, it is assumed that the terminal will establish a dialogue with the user. Such dialogue allows the user to manually accept some of the proposed parameters by the originator. This is typically media type (audio, video, whiteboard) and different quality parameters per media type. As an alternative, the user preferences may be pre-configured.

- Before establishing or accepting a new session, the user may define or agree on the following parameters. Some of these parameters may be pre-configured and others are defined on a per session basis.

    1. Type of media, i.e. audio, video, whiteboard, etc. This represents the user preferences of media types.

2. Combination of QoS attributes and selection of codec. This represents the quality of the media component, the cost and the probability of availability of resources both in the access network and in the core network.

3. Subset of capabilities used in the terminal. Terminals can have different set of capabilities. However, the user may or may not want to use the maximum set of capabilities. For instance, a user might want to establish a low cost video session with a small window on the screen.

4. End-to-end quality of service. For certain media streams, the user may want assured end-to-end QoS while for other streams the QoS may be optional or even not desired at all (best effort).

### 5.4.6.3 Mechanism for bearer establishment

In order to fulfil the above requirements, it is needed that the destination user can be pre-alerted before the bearer establishment and negotiation and PDP context activation has taken place. This gives room for the destination user to choose the media streams and codecs required before an expensive resource (as the air interface is) is established.

Figure 5.7 shows the mechanism for the bearer establishment in which the pre-alerting occurs before the initial bearer creation procedures are performed. Furthermore, a user interaction may also occur after the initial bearers are created as shown in figure 5.7. If the session originator receives multiple provisional responses for the same session indicating that the session has been forked in the network, the UE may choose to process a pre-configured number of responses.  In the case of multiple responses, the resources requested by the UE shall be the “logical OR” (i.e. least upper bound) of the resources indicated in the multiple responses to avoid allocation of unnecessary resources. The UE shall never request more resources then was originally proposed in the Original INVITE.

The "Other x-CSCFs" entity in figure 5.7 comprises several CSCFs: I-CSCF and S-CSCFs. For the sake of simplicity only the GGSNs are presented from the UMTS access network and the Policy Control Functions have been omitted from the diagram.

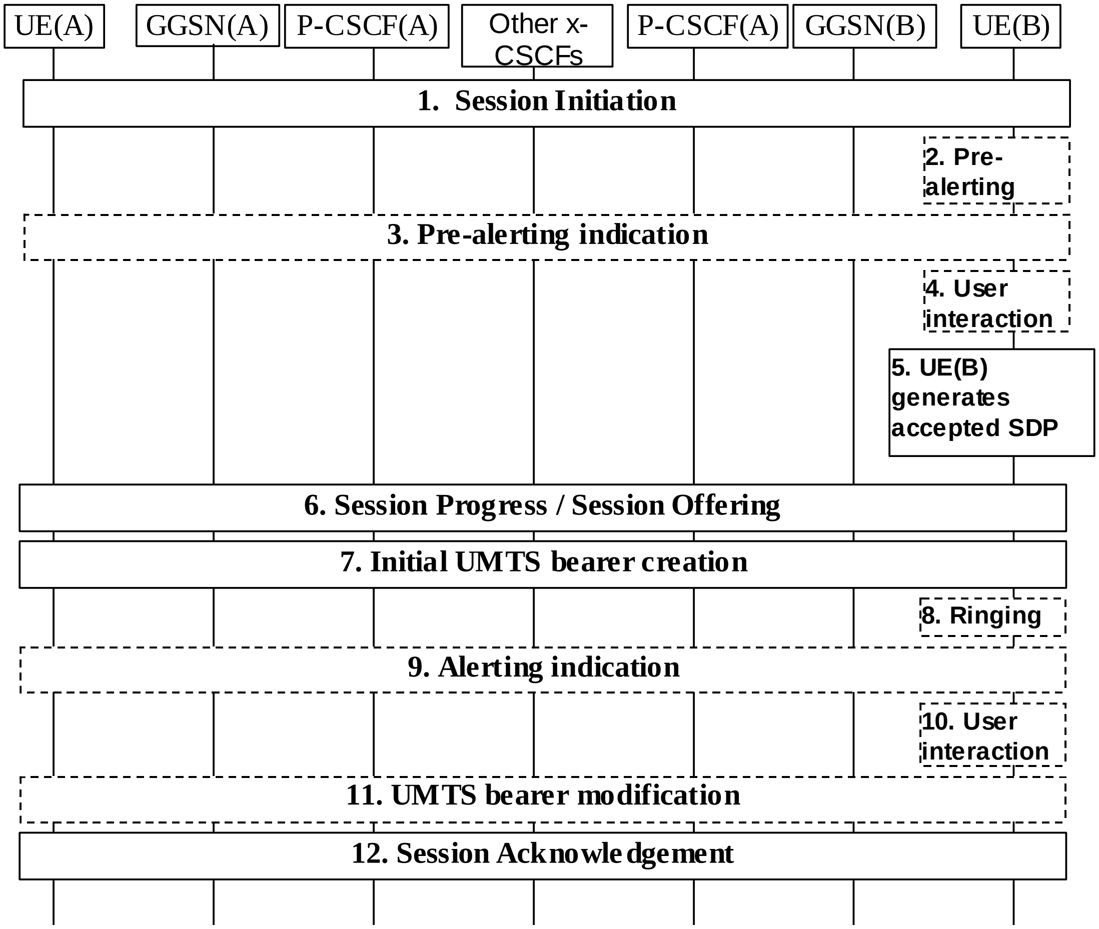

UE(A)
GGSN(A)
P-CSCF(A)
Other x-CSCFs
P-CSCF(A)
GGSN(B)
UE(B)
1. Session Initiation
2. Pre-alerting
3. Pre-alerting indication
4. User interaction
5. UE(B) generates accepted SDP
6. Session Progress / Session Offering
7. Initial UMTS bearer creation
8. Ringing
9. Alerting indication
10. User interaction
11. UMTS bearer modification
12. Session Acknowledgement

**Figure 5.7: Bearer establishment showing optional pre-alerting**

1. UE(A) starts a Session Initiation procedure to UE(B) that includes an SDP proposal.

The steps 2-4 are optional and may depend on terminal implementation and/or terminal pre-configured settings.

2. The user at UE(B) is pre-alerted.
3. An indication of the pre-alerting may be sent towards UE(A).
4. User at UE(B) will then interact and express his/her wishes regarding the actual session.
5. UE(B) generates accepted SDP based on terminal settings, terminal pre-configured profiles and optionally the user's wishes.
6. The accepted SDP is forwarded to UE(A) in the payload of a reliable SIP response.
7. Initial bearer creation procedure is performed. During this bearer creation step the resources in the UE(A)'s and UE(B)'s access network are reserved with PDP context procedures. Bearer resources in external networks may also be reserved at this point.

The steps 8-10 are also optional and may be skipped.

8. Terminal at UE(B) starts ringing.
9. The alerting indication is sent towards UE(A).
10. User at UE(B) may interact and express his/her wishes regarding the actual session.

11. UE(A) and UE(B) may perform bearer modification procedure at this point, if the initial bearers reserved in step 7 and the wishes of user at UE(B) are different. During this bearer modification step the resources in the UE(A)'s and UE(B)'s access network may be modified by modifying the PDP context, and the resource reservation in the external network may also be modified.

12. Session initiation procedure is acknowledged.

#### 5.4.6.4 Session progress indication to the originating UE

The pre-alerting or alerting indications returned to the originating UE shall enable the

originating UE to inform the calling user of the session progress prior to the arrival of the incoming media (for example the originating UE may synthesise ringing locally).

### 5.4.7 Interaction between QoS and session signalling

At PDP context setup the user shall have access to either GPRS without service-based local policy, or GPRS with service-based local policy. It is operator choice whether to offer both or only one of these alternatives for accessing the IM Subsystem.

For the GPRS without service-based local policy case, the bearer is established according to the user’s subscription, local operator’s IP bearer resource based policy, local operator's admission control function and GPRS roaming agreements. The establishment of the PDP context bearer shall use the PDP context activation procedure specified in TS 23.060.

For the GPRS with service-based local policy case, Service-Based Local Policy decisions (e.g., authorisation and control) are also applied to the bearer.

The description in this subsection is applicable for the case when service-based local policy is employed.

The GGSN contains a Policy Enforcement Function (PEF) that has the capability of policing packet flow into the IP network, and restricting the set of IP destinations that may be reached from/through a PDP context according to a packet classifier. This service-based policy ‘gate’ function has an external control interface that allows it to be selectively ‘opened’ or ‘closed’ on the basis of IP destination address and port. When open, the gate allows packets to pass through (to the destination specified in the classifier) and when closed, no packets are allowed to pass through. The control is performed by a PCF, which is a logical entity of the P-CSCF. (Note: If the PCF is implemented in a separate physical node, the interface between the PCF and the P-CSCF is not standardised).

There are seven interactions defined for service-based local policy:

1. Authorize QoS Resources.
2. Resource Reservation with Service-based Local Policy.
3. Approval of QoS Commit for resources authorised in (1), e.g. ‘open’ the ‘gate’.
4. Removal of QoS Commit for resources authorised in (1), e.g. ‘close’ the ‘gate’.
5. Revoke Authorisation for GPRS and IP resources.
6. Indication of PDP Context Release from the GGSN to the PCF.
7. Indication of PDP Context Modification from the GGSN to the PCF.

These requirements and functional description of these interactions are explained further in the following sections. The complete specification of the interface between the Policy Control Function and the Policy Enforcement Function is contained in TS 23.207.

#### 5.4.7.1 Authorize QoS Resources

The Authorize QoS Resources procedure is used during an establishment of a SIP session. The P-CSCF(PCF) shall use the SDP contained in the SIP signaling to calculate the proper authorisation. The PCF authorizes the required QoS resources.

The authorisation shall include binding information, which shall also be provided by the UE to the GGSN in the allocation request, which enables accurate matching of requests and authorisations. The binding information includes an

Authorisation Token sent by the P-CSCF to the UE during SIP signaling, and one or more Flow Identifiers, which are used, by the UE, GGSN and PCF to uniquely identify the media component(s). If forking has occurred, the P-CSCF will re-use the same Authorisation Token in all subsequent provisional responses belonging to the same session. If the least upper bound of the requested resources is changed due to a subsequently received response then an update of the authorised resources is performed.

The authorisation shall be expressed in terms of the IP resources to be authorised and shall include limits on IP packet flows, and may include restrictions on IP destination address and port.

### 5.4.7.1a Resource Reservation with Service-based Local Policy

The GGSN serves as the Policy Enforcement Point that implements the policy decisions for performing admission control and authorising the GPRS and IP BS QoS Resource request, and policing IP flows entering the external IP network.

Authorisation of GPRS and IP QoS Resources shall be required for access to the IP Multimedia Subsystem. The GGSN shall determine the need for authorisation, possibly based on provisioning and/or based on the APN of the PDP context.

Resource Reservation shall be initiated by the UE, and shall take place only after successful authorisation of QoS resources by the PCF. Resource reservation requests from the UE shall contain the binding information. The use of this binding information enables the GGSN to correctly match the reservation request to the corresponding authorisation. The authorisation shall be 'Pulled' from the PCF by the GGSN when the reservation request is received from the UE. When a UE combines multiple media flows onto a single PDP context, all of the binding information related to those media flows shall be provided in the resource reservation request.

With a request for GPRS QoS resources, the GGSN shall verify the request is less than the sum of the authorised IP resources (within the error tolerance of the conversion mechanism) for all of the combined media flows. With a request for IP QoS resources, the GGSN shall verify the request is less than the authorised IP resources.

The request for GPRS QoS resources may be signaled independently from the request for IP QoS resources by the UE. At the GPRS BS Level, the PDP Context activation shall be used for QoS signaling. At the IP BS Level, RSVP may be used for QoS signaling.

### 5.4.7.2 Approval of QoS Commit

The PCF makes policy decisions and provides an indication to the GGSN that the user is now allowed to use the allocated QoS resources for per-session authorisations unless this was done based on service based local policy at the time of the Resource Reservation procedure. If there is more than one response for the same session, indicating that the session has been forked in the network, the PCF may authorise the “logical OR” of the resources requested in the responses. When the session established indication has been received, if the PCF earlier have authorised the "logical OR" of the resources then the PCF will modify the authorisation and commit to resources according to the session established indication.

The GGSN enforces the policy decisions. The GGSN may restrict any use of the GPRS resources prior to this indication from the PCF. The GGSN shall restrict any use of the IP resources prior to this indication from the PCF, e.g. by open the gate and enabling the use of resources for the media flow. Based on local policy, GPRS and/or IP resources may beallowed to be used by the user at the time they are authorised by the PCF.

### 5.4.7.3 Removal of QoS Commit

The PCF makes policy decisions and provides an indication to the GGSN about revoking the user’s capacity to use the allocated QoS resources for per-session authorisations. Removal of QoS Commit for GPRS and IP resources shall be sent as a separate decision to the GGSN corresponding to the previous "Approval of QoS commit" request.

The GGSN enforces the policy decisions. The GGSN may restrict any use of the GPRS resources after this indication from the PCF. The GGSN shall restrict any use of the IP resources after this indication from the PCF, e.g. by closing the gate and blocking the media flow.

### 5.4.7.4 Revoke Authorisation for GPRS and IP Resources

At IP multimedia session release, the UE should deactivate the PDP context(s) used for the IP multimedia session. In various cases, such as loss of signal from the mobile, the UE will be unable to perform this release itself. The Policy Control Function provides indication to the GGSN when the resources previous authorised, and possibly allocated by the UE, are to be released. The GGSNshall deactivate the PDP context used for the IP multimedia session.

#### 5.4.7.5 Indication of PDP Context release

Any release of a PDP Context that was established based on authorisation from the PCF shall be reported to the PCF by the GGSN.

This indication may be used by the PCF to initiate a session release towards the remote endpoint.

#### 5.4.7. 5a Indication of PDP Context modification

When a PDP Context is modified such that the requested QoS falls outside of the limits that were authorized at PDP context activation (or last modification) or such that the maximum bit rate (downlink and uplink) is downgraded to 0 kbit/s then the GGSN shall report this to the PCF.

This indication may be used by the PCF to initiate a session release towards the remote endpoint.

#### 5.4.7.6 void

#### 5.4.7.7 void

### 5.4.8 QoS-Assured Preconditions

This section contains concepts for the relation between the resource reservation procedure and the procedure for end-to-end sessions.
A precondition as defined in SIP WG, is a set of constraints about the session which are introduced during the session initiation. The recipient of the session generates an answer, but does not alert the user or otherwise proceed with session establishment until the preconditions are met. This can be known through a local event (such as a confirmation of a resource reservation), or through a new set of constraints sent by the caller.

A “QoS-Assured” session will not complete until required resources have been allocated to the session. In a QoS-Assured session, the UE must succeed in establishing the QoS bearer for the media stream according to the QoS preconditions defined at the session level before it may indicate a successful response to complete the session and alert the other end point. The principles for when a UE shall regard QoS preconditions to be met are:

- A minimum requirement to meet the QoS preconditions defined for a media stream in a certain direction, is that a satisfactory PDP context is established at the local access for that direction.
- Segmented resource reservation is performed since the end points are responsible to make access network resource reservations via local mechanisms.
- The end points shall offer the resources it may want to support for the session and negotiate to an agreed set. Multiple negotiation steps may be needed in order to agree on a set of media for the session. The final agreed set is then updated between the end points.
- The action to take in case a UE fails to fulfil the pre-conditions (e.g. failure in establishment of an RSVP session) depends on the reason for failure. If the reason is lack of resources in the network (e.g. an admission control function in the network rejects the request for resources), the UE shall fail to complete the session. For other reasons (e.g. lack of RSVP host or proxy along the path) the action to take is local decision within the UE. It may for example 1) choose to fail to complete the session, 2) attempt to complete the session by no longer requiring some of the additional actions (e.g. fall back to satisfactory establishment of PDP context only).

### 5.4.9 Event and information distribution

The S-CSCF and Application Servers (SIP-AS, IM-SSF, OSA-SCS) shall be able to send service information messages to endpoints. This shall be done based on a SIP Request/Response information exchange containing the service information and/or a list of URI(s) pointing to the location of information represented in other media formats. The stimulus for initiating the service event related information message may come from e.g. a service logic residing in an application server.

In addition, the end points shall also be able to send information to each other. This information shall be delivered using SIP based messages. The corresponding SIP messages shall be forwarded along the IMS SIP signalling path. This includes the S-CSCF but may also include SIP application servers. The information may be related or unrelated to any ongoing session and/or may be independent of any session. Applicable mechanisms (for e.g. routing, security, charging, etc) defined for IMS SIP sessions shall also be applied for the SIP based messages delivering the end-point information.

The length of the information transferred is restricted by the message size (e.g. the MTU), so fragmentation and re-assembly of the information is not required to be supported in the UE. This information may include e.g. text message, http url, etc.

This mechanism considers the following issues:

- The IMS has the capability to handle different kinds of media. That is, it is possible to provide information contained within several different media formats e.g. text, pictures or video.
- The UE's level of supporting service event related information and its exchange may depend on the UE's capabilities and configuration.
- A UE not participating in the service related information exchange shall not be effected by a service related information exchange possibly being performed with another UE of the session.

Note: The service event related information exchange may either take place in the context of a session, or independently outside the context of any existing session.

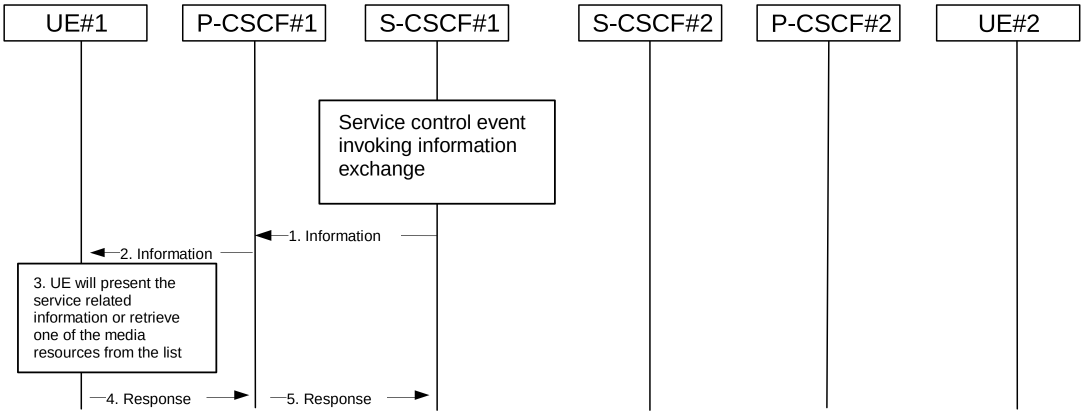

UE#1
P-CSCF#1
S-CSCF#1
S-CSCF#2
P-CSCF#2
UE#2
Service control event invoking information exchange
1. Information
2. Information
3. UE will present the service related information or retrieve one of the media resources from the list
4. Response
5. Response

**Figure 5.8: Providing service event related information to related endpoint**

1. When a service event occurs that the S-CSCF or the Application Server wishes to inform an endpoint about, the S-CSCF or the Application Server generates a message request containing information to be presented to the user. The contents may include text describing the service event, a list of URI(s) or other service modification information.
2. P-CSCF forwards the message request.
3. UE presents the service-related information, to the extent that it conforms to its capabilities and configuration, to the user.
4. Possibly after interaction with the user, the UE will be able to include information in the response to the S-CSCF.
5. P-CSCF forwards the response.

Note 1: The UE may retrieve service event related information using normal PS Domain or IMS procedures.

Note 2: transport aspects of the information transfer described above may require further considerations.

## 5.4.10 Overview of session flow procedures

This section contains the overview description and list of individual procedures for the end-to-end session flows.

For an IP Multi-Media Subsystem session, the session flow procedures are shown in the following diagram.

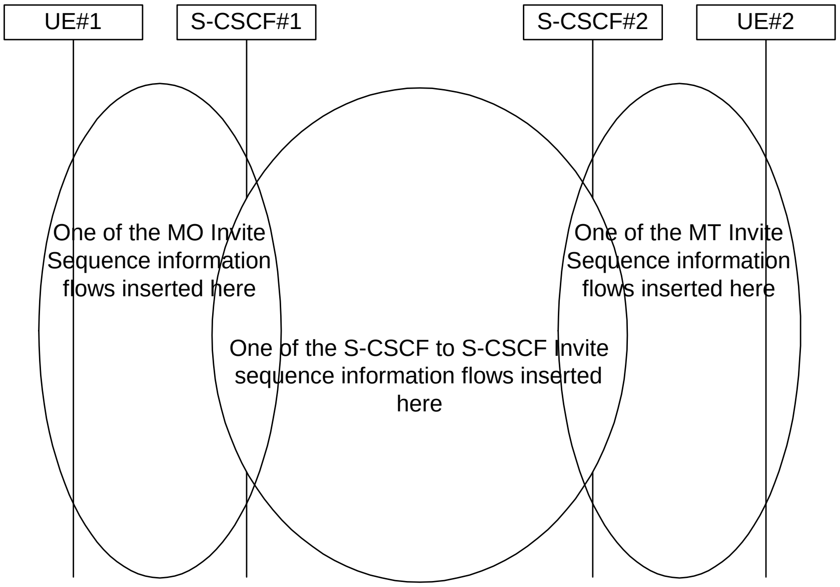

UE#1
S-CSCF#1
S-CSCF#2
UE#2
One of the MO Invite Sequence information flows inserted here
One of the MT Invite Sequence information flows inserted here
One of the S-CSCF to S-CSCF Invite sequence information flows inserted here

**Figure 5.9: Overview of Session Flow Sections**

The following procedures are defined:

For the origination sequence:

- (MO#1) Mobile origination, roaming
- (MO#2) Mobile origination, home
- (PSTN-O) PSTN origination

For the termination sequence:

- (MT#1) Mobile termination, roaming
- (MT#2) Mobile termination, home
- (MT#3) Mobile termination, CS Domain roaming
- (PSTN-T) PSTN termination

For Serving-CSCF/MGCF-to-Serving-CSCF/MGCF sequences:

- (S-S#1) Session origination and termination are served by different network operators,
- (S-S#2) Session origination and termination are served by the same operator.
- (S-S#3) Session origination with PSTN termination in the same network as the S-CSCF.
- (S-S#4) Session origination with PSTN termination in a different network to the S-CSCF

The media being offered and acknowledged to can take multiple negotiation steps or only one negotiation may be used. In these flows, a minimum of two negotiations has been shown. But the subsequent responses may not carry any media information and just confirm the initial media set agreement.

For example, for a non-roaming ~~subscriber~~ user initiating a session to another non-roaming user~~subscriber~~, each a subscriber of the same network operator, it is possible to construct a complete end-to-end session flow from the following procedures:

- (MO#2) Mobile origination, home
- (S-S#2) Single network operator,

- (MT#2) Mobile termination, home

There are a large number of end-to-end session flows defined by these procedures. They are built from combinations of origination, serving to serving, and termination procedures, as determined from the following table. For each row of the table, any one of the listed origination procedures can be combined with any one of the serving-serving procedures, which can be combined with any one of the termination procedures. In addition, several of the procedures give alternatives for network configuration hiding (the number of such alternatives is shown in parentheses).

Service control can occur at any point during a session, based on the filter criteria.

Note that the flows show service control only for the initial INVITE for originating and terminating party as an example.

**Table 5.2: Combinations of session procedures**

| Origination Procedure (pick one) | Serving-CSCF-to-Serving-CSCF Procedure (pick one) | Termination Procedure (pick one) |
|---|---|---|
| MO#1 Mobile origination, roaming, home control of services (2).<br>MO#2 Mobile origination, located in home service area.<br>PSTN-O PSTN origination. | S-S#1 Different network operators performing origination and termination, with home control of termination (2).<br>S-S#2 Single network operator performing origination and termination, with home control of termination. | MT#1 Mobile termination, roaming, home control of services(2).<br>MT#2 Mobile termination, located in home service area.<br>MT#3 Mobile termination, CS Domain roaming. |
| MO#1 Mobile origination, roaming, home control of services (2).<br>MO#2 Mobile origination, located in home service area. | S-S#3 PSTN termination in the same network as the S-CSCF.<br>S-S#4 PSTN termination in different network than the S-CSCF | PSTN-T PSTN termination. |

## 5.4.11 Signalling Transport Interworking

A Signalling gateway function (SGW) is used to interconnect different signalling networks i.e. SCTP/IP based signalling networks and SS7 signalling networks. The signalling gateway function may be implemented as a stand alone entity or inside another entity [1]. The session flows in this specification do not show the SGW, but when interworking with PSTN/CS domain, it is assumed that there is a SGW for signalling transport conversion.

next modified section

## 5.5.1 (S-S#1) Different network operators performing origination and termination

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. The request is therefore forwarded (optionally through an an I-CSCF(THIG) within the originating operator's network) to a well-known entry point in the destination operator's network, the I-CSCF. The I-CSCF queries the HSS for current location information, and finds the ~~subscriber~~ user either located in the home service area, or roaming. The I-CSCF therefore forwards the request to the S-CSCF serving the destination ~~subscriber~~user.

Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming. The "Originating Network" of S-S#1 is therefore a visited network.

MO#2 Mobile origination, home. The “Originating Network” of S-S#1 is therefore the home network.

PSTN-O PSTN origination. The “Originating Network” of S-S#1 is the home network. The element labeled S-CSCF#1 is the MGCF of the PSTN-O procedure.

Termination sequences that share this common S-S procedure are:

MT#1 Mobile termination, roaming. The “Terminating Network” of S-S#1 is a visited network.

MT#2 Mobile termination, located in home service area. The “Terminating Network” of S-S#1 is the home network.

MT#3 Mobile termination, CS Domain roaming. The “Terminating Network” of S-S#1 is a CS domain network.

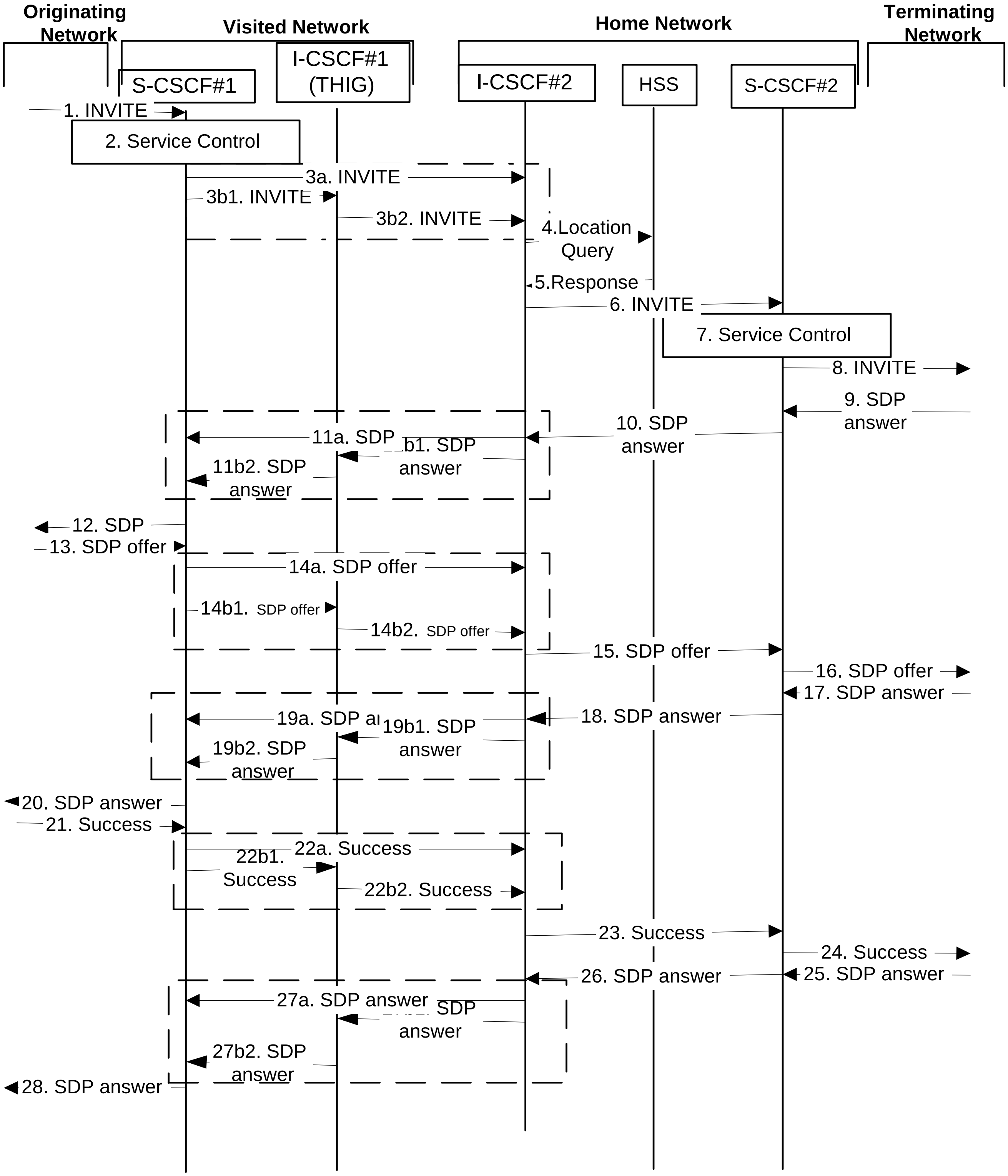


**Figure 5.10-1: Serving to serving procedure - different operators (part 1)**

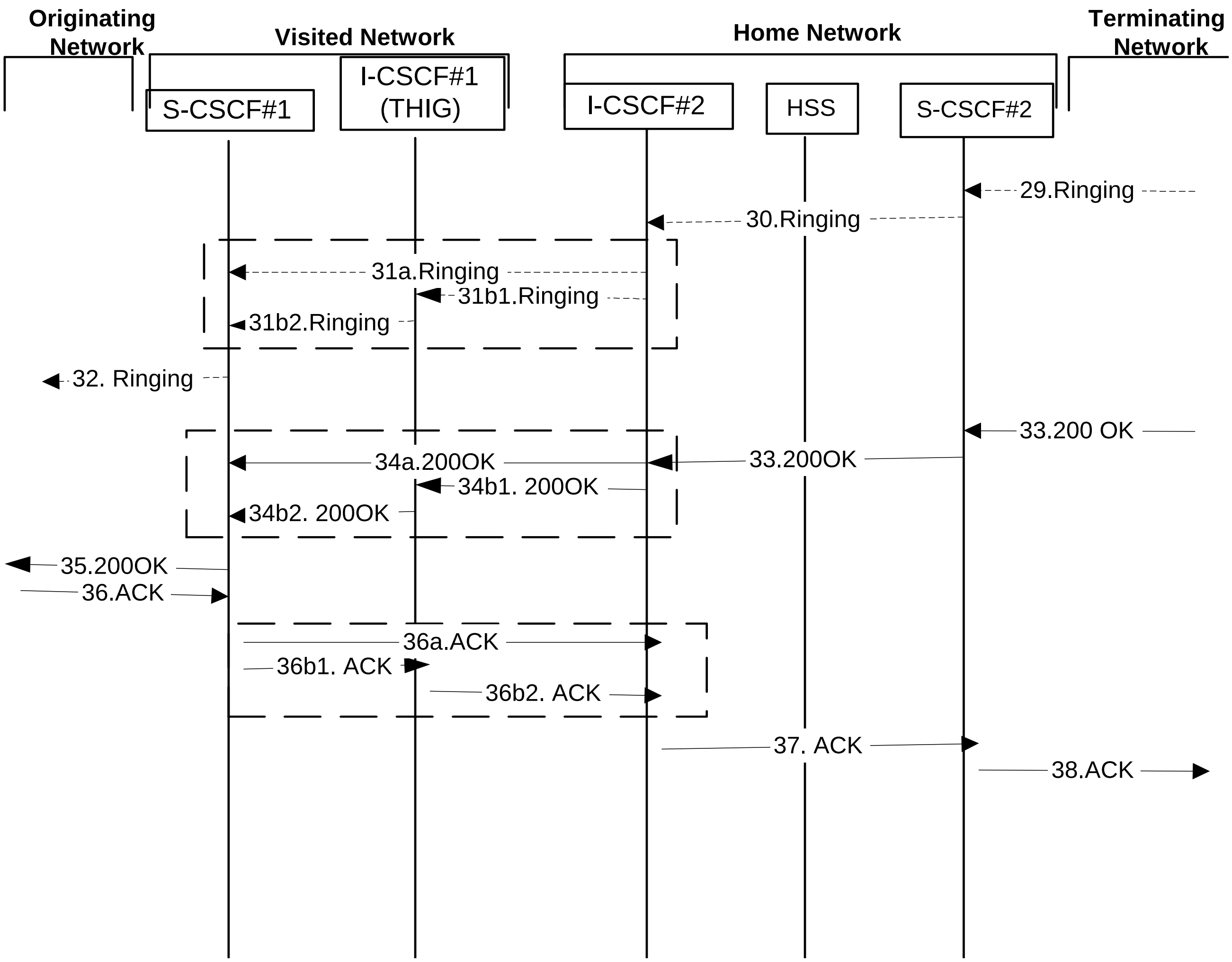


**Figure 5.10-2: Serving to serving procedure - different operators (part 2)**

Procedure S-S#1 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. For S-S#1, flow (2) is an inter-operator message to the I-CSCF entry point for the terminating ~~subscriber~~user. If the originating operator desires to keep their internal configuration hidden, then S-CSCF#1 forwards the INVITE request through I-CSCF(THIG)#1 (choice (b)); otherwise S-CSCF#1 forwards the INVITE request directly to I-CSCF#2, the well-known entry point into the terminating ~~subscriber's~~ user's network (choice (a)).

   (3a) If the originating network operator does not desire to keep their network configuration hidden, the INVITE request is sent directly to I-CSCF#2.

   (3b) If the originating network operator desires to keep their network configuration hidden, the INVITE request is forwarded through an I-CSCF(THIG) in the originating operator's network, I-CSCF(THIG)#1.

   (3b1) The INVITE request is sent from S-CSCF#1 to I-CSCF(THIG)#1

   (3b2) I-CSCF(THIG)#1 performs the configuration-hiding modifications to the request and forwards it to I-CSCF#2

4. I-CSCF#2 (at the border of the terminating ~~subscriber's~~ user's network) may query the HSS for current location information. If I-CSCF#2 cannot determine, based on analysis of the destination number, that the HSS query will fail, then it will send "Cx-location-query" to the HSS to obtain the location information for the destination. If I-CSCF#2 can determine, based on analysis of the destination number, that the HSS query will fail, it will not send the "Cx-location-query" message, allocate a MGCF for a PSTN termination, and continue with step #6.

5. HSS responds with the address of the current Serving-CSCF for the terminating user~~subscriber~~.

6. I-CSCF#2 forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt

8. The sequence continues with the message flows determined by the termination procedure.

9. The media stream capabilities of the destination are returned along the signalling path, as per the termination procedure.

10. S-CSCF#2 forwards the SDP to I-CSCF#2

11. I-CSCF#2 forwards the SDP to S-CSCF#1. Based on the choice made in step #3 above, this may be sent directly to S-CSCF#1 (11a) or may be sent through I-CSCF(THIG)#1 (11b1 and 11b2)

12. S-CSCF#1 forwards the SDP to the originator, as per the originating procedure.

13. The originator decides on the offered set of media streams, and forwards this information to S-CSCF#1 by the origination procedures

14-15. S-CSCF#1 forwards the offered SDP to S-CSCF#2. This may possibly be routed through I-CSCF#1or I-CSCF#2 depending on operator configuration of the I-CSCFs

16. S-CSCF#2 forwards the offered SDP to the terminating endpoint, as per the termination procedure

17-20 The terminating end point acknowledges the offer with answered SDP and passes through the session path to the originating end point.. 21-24. Originating end point acknowledges successful resource reservation and the message is forwarded to the terminating end point.

25-28. Terminating end point acknowledges the response and this message is sent to the originating end point through the established session path.

29-32. Terminating end point then generates ringing and this message is sent to the originating end point through the established session path.

33-35. Terminating end point then sends 200 OK via the established session path to the originating end point.

36-38. Originating end point acknowledges the establishment of the session and sends to the terminating end point via the established session path.

next modified section

## 5.5.2 (S-S#2) Single network operator performing origination and termination

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines that it belongs to a subscriber of the same operator. The request is therefore forwarded to a local I-CSCF. The I-CSCF queries the HSS for current location information, and finds the ~~subscriber~~ user either located in the home service area, or roaming. The I-CSCF therefore forwards the request to the S-CSCF serving the destination user~~subscriber~~.

Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming,. The "Originating Network" of S-S#2 is therefore a visited network.

MO#2 Mobile origination, home. The "Originating Network" of S-S#2 is therefore the home network.

PSTN-O PSTN origination. The “Originating Network” of S-S#2 is the home network. The element labelled S-CSCF#1 is the MGCF of the PSTN-O procedure.

Termination sequences that share this common S-S procedure are:

MT#1 Mobile termination, roaming, . The “Terminating Network” of S-S#2 is a visited network.

MT#2 Mobile termination, home. The “Terminating Network” of S-S#2 is the home network.

MT#3 Mobile termination, CS Domain roaming. The “Terminating Network” of S-S#2 is a CS domain network.

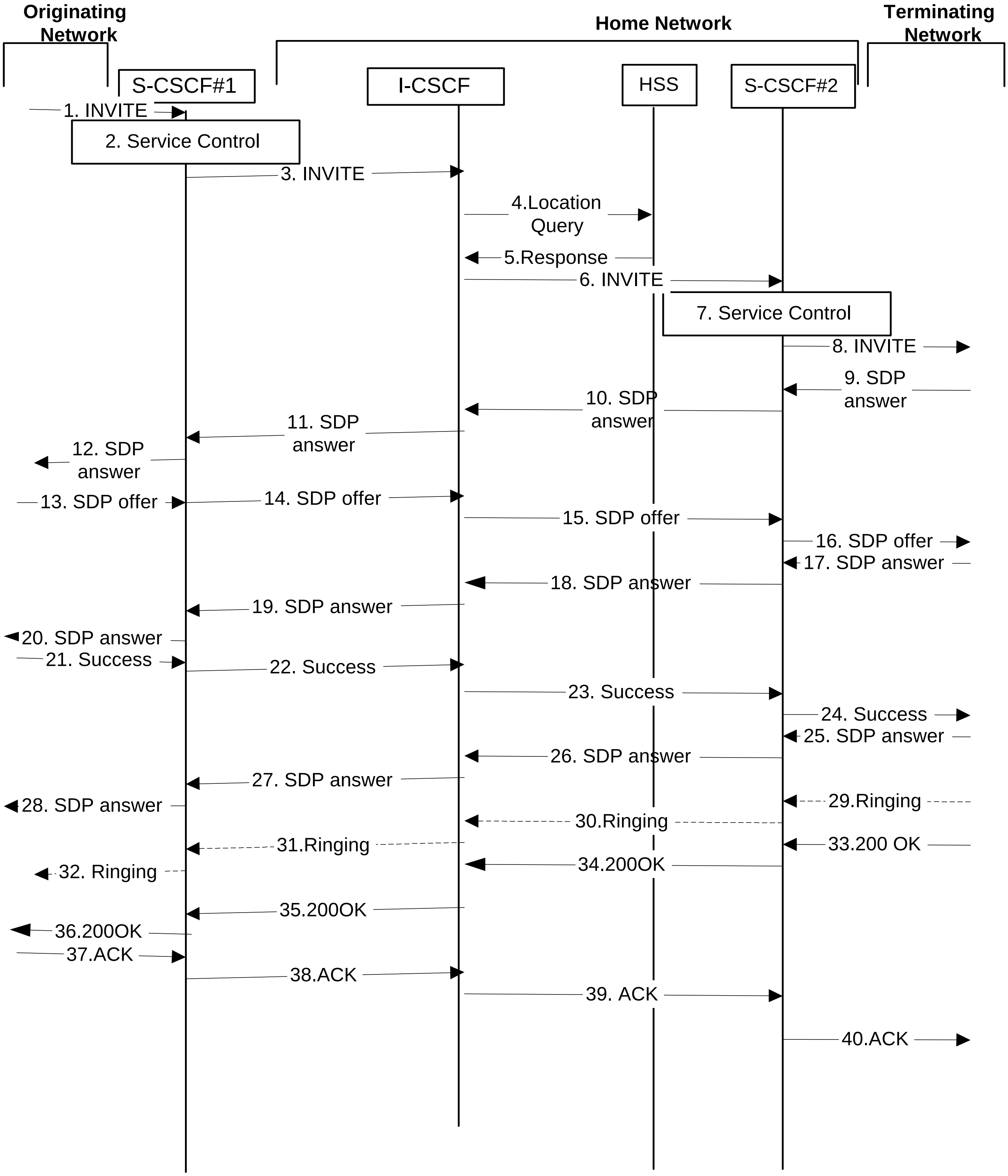


**Figure 5.11: Serving to serving procedure - same operator**

Procedure S-S#2 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt

3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. Since it is local, the request is passed to a local I-CSCF.

4. I-CSCF may query the HSS for current location information. If I-CSCF cannot determine, based on analysis of the destination number, that the HSS query will fail, then it will send “Cx-location-query” to the HSS to obtain the location information for the destination. If I-CSCF can determine, based on analysis of the destination number, that the HSS query will fail, it will not send the “Cx-location-query” message, allocate a MGCF for a PSTN termination, and continue with step #6.

5. HSS responds with the address of the current Serving-CSCF for the terminating ~~subscriber~~user.

6. I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt

8. The sequence continues with the message flows determined by the termination procedure.

9-12. The terminating end point responds with an answer to the offered SDP and this message is passed along the established session path.

13-16. The originator decides on the offered set of media streams, and forwards this information to S-CSCF#1 by the origination procedures. This message is forwarded via the established session path to the terminating end point.

17-20. Terminating end point responds to the offered SDP and the response if forwarded to the originating end point via the established session path.

21-24. Originating end point sends successful resource reservation information towards the terminating end point via the established session path.

25-28. Terminating end point sends successful resource reservation acknowledgement towards the originating end point via the established session path

29. Terminating end point sends ringing message to S-CSCF#2.

30.S-CSCF#2 forwards the ringing message to I-CSCF

31. I-CSCF forwards the ringing message to S-CSCF#1.

32. S-CSCF#1 forwards the ringing message to the originator, per the origination procedure

33. The SIP final response, 200-OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the ~~subscriber~~ user has accepted the incoming session setup attempt. The message is sent to S-CSCF#2 per the termination procedure.

34. S-CSCF#2 performs whatever service control logic is appropriate for this session setup completion

35. The 200-OK is passed to the I-CSCF

36. The 200-OK is passed to the S-CSCF#1

37. The 200-OK is passed to the Originating Network

38. The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

39. S-CSCF#1 forwards this message to S-CSCF#2.

40. S-CSCF#2 forwards this message to the terminating endpoint, as per the termination procedure

### 5.5.3 (S-S#3) Session origination with PSTN termination in the same network as the S-CSCF.

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines, with support of applications or other databases, that the session is destined to the PSTN. The request is therefore forwarded to a local BGCF. The BGCF determines that the MGCF should be in the same network, and selects a MGCF in that network. The request is then forwarded to the MGCF.

Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming. The “Originating Network” of S-S#3 is therefore a visited network.

MO#2 Mobile origination, located in home service area. The “Originating Network” of S-S#3 is therefore the home network.

Termination sequences that share this common S-S procedure are:

PSTN-T PSTN termination. This occurs when the MGCF is selected to be in the same network as the S-CSCF.

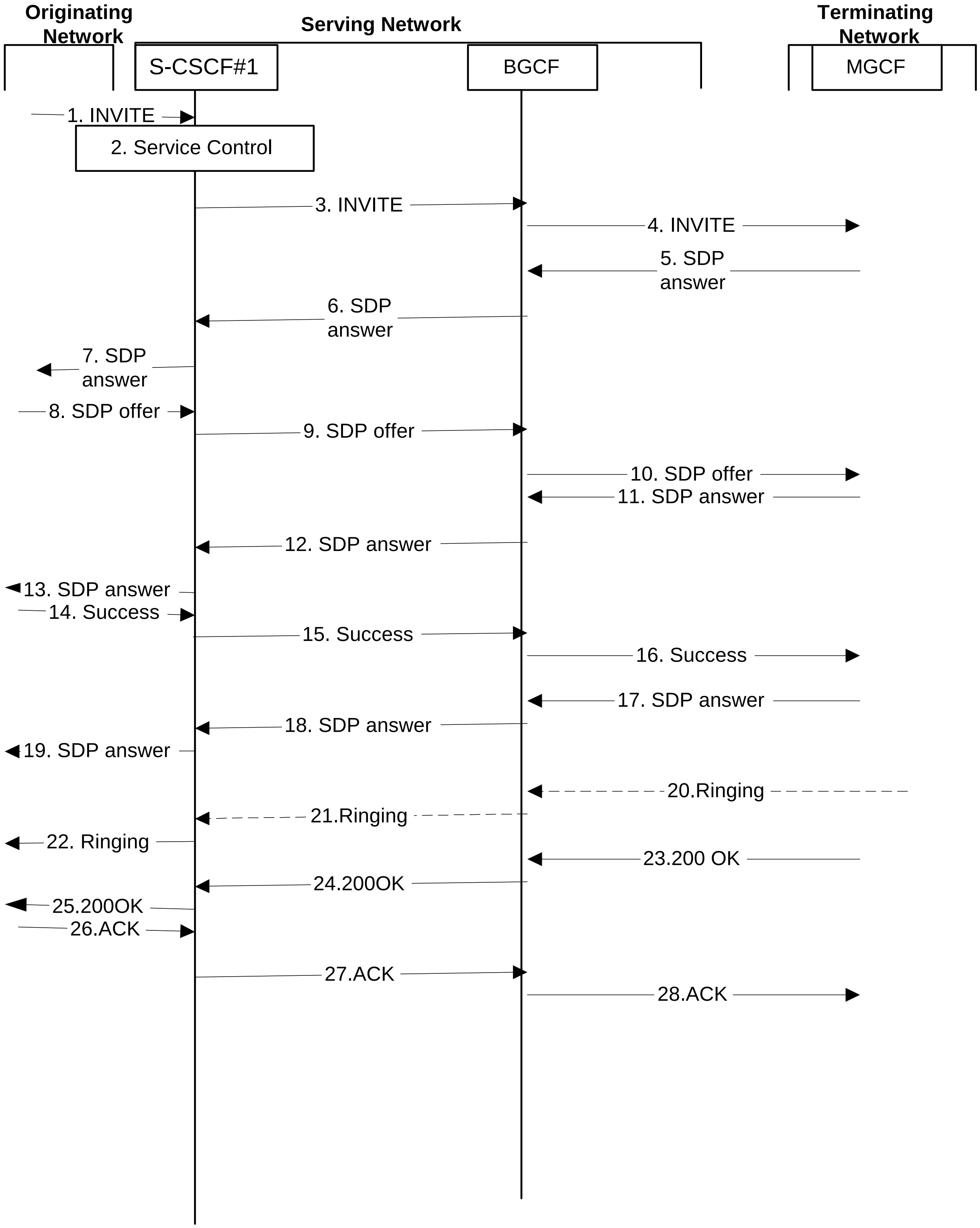


**Figure 5.12: Serving to PSTN procedure - same operator**

Procedure S-S#3 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt

3. S-CSCF#1 performs an analysis of the destination address. From the analysis of the destination address, S-CSCF#1 determines that this is for the PSTN, and passes the request to the BGCF.

4. The BGCF determines that the MGCF shall be in the same network, and hence proceeds to select an appropriate MGCF. The SIP INVITE request is forwarded to the MGCF. The PSTN terminating information flows are then followed.

5-7. The media stream capabilities of the destination are returned along the signalling path as SDP answer, as per the PSTN termination procedure.

8. The originator decides the offered set of media streams, and forwards this information to S-CSCF#1 by the origination procedures

9-10. S-CSCF#1 forwards the offered SDP to the terminating endpoint as per the PSTN terminating procedures via the established session path.

11-13. The terminating end point answers to the offered SDP and the message is passed through the established session path to the originating end point.

14-16. When the originating endpoint has completed the resource reservation procedures, it sends the successful resource reservation message to S-CSCF#1 by the origination procedures and it is passed to the terminating end point through the session path.

17-19. . The terminating endpoint acknowledges the result and the message is passed onto the originating end point via the session path.

20-21. Terminating end point generates ringing message and forwards it to BGCF which in tern forwards the message to SCSCF#1. 22.S-CSCF#1 forwards the ringing message to the originator, per the origination procedure

23. When the destination party answers, the termination procedure results in a SIP 200-OK final response to the BGCF

24-25. The BGCF forwards this information to the S-CSCF#1 and then it is forwarded to the originating end point.

26. The 200-OK is returned to the originating endpoint, by the origination procedure from terminating end point.

27. The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

28. S-CSCF#1 forwards this message to the terminating endpoint as per the PSTN terminating procedures.

next modified section

### 5.6.1 (MO#1) Mobile origination, roaming

This origination procedure applies to roaming ~~subscribers~~users. .

The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure described in section 5.1.1. The home network advertises either the S-CSCF or an I-CSCF as the entry point from the visited network.

When registration is complete, P-CSCF knows the name/address of the next hop in the signalling path toward the serving-CSCF, either I-CSCF(THIG) (if the home network wanted to hide their internal configuration) or S-CSCF (if there was no desire to hide the network configuration). I-CSCF, if it exists in the signalling path, knows the name/address of S-CSCF.

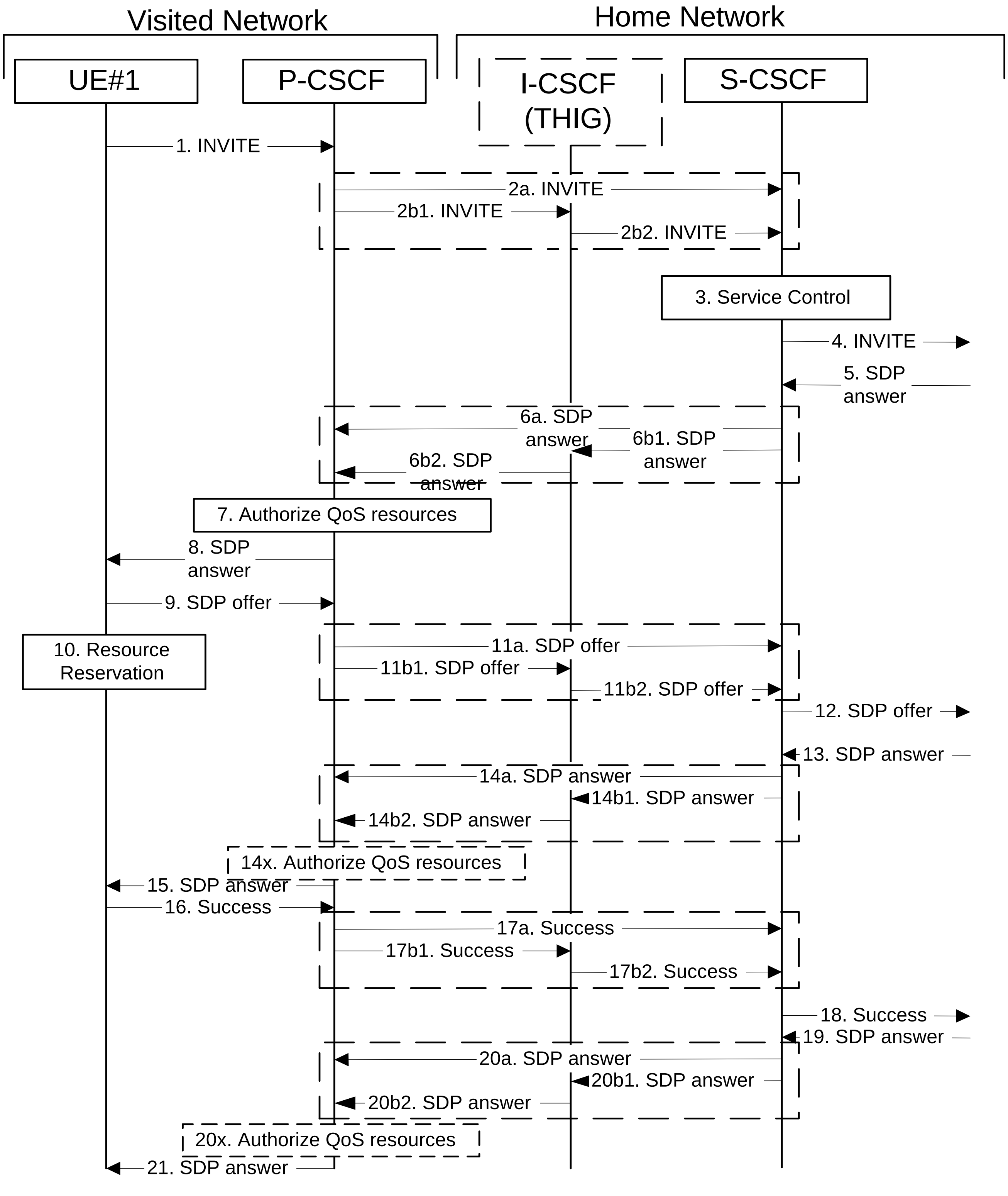


**Figure 5.14-1: Mobile origination procedure - roaming (part 1)**

Error! Objects cannot be created from editing field codes. **Figure 5.14-2: Mobile origination procedure – roaming (part 2)**

Procedure MO#1 is as follows:

1. UE sends the SIP 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 multi-media session.

2. P-CSCF remembers (from the registration procedure) the next hop CSCF for this UE.

   This next hop is either the S-CSCF that is serving the visiting UE (choice (a)), or an I-CSCF(THIG) within the home network that is performing the configuration hiding function for the home network operator (choice (b)).

   (2a) If the home network operator does not desire to keep their network configuration hidden, the name/address of the S-CSCF was provided during registration, and the INVITE request is forwarded directly to the S-CSCF.

   (2b) If the home network operator desires to keep their network configuration hidden, the name/address of an I-CSCF(THIG) in the home network was provided during registration, and the INVITE request is forwarded through this I-CSCF(THIG) to the S-CSCF.

   (2b1) P-CSCF forwards the INVITE request to I-CSCF(THIG)

   (2b2) I-CSCF(THIG) forwards the INVITE request to S-CSCF

3. S-CSCF validates the service profile, and performs any origination service control required for this ~~subscriber~~user. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

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

5. The media stream capabilities of the destination are returned along the signalling path, per the S-S procedures.

6. S-CSCF forwards the SDP message to P-CSCF. Based on the choice made in step #2 above, this may be sent directly to P-CSCF (6a) or may be sent through I-CSCF(THIG)(firewall) (6b1 and 6b2).

7. P-CSCF authorises the resources necessary for this session. The Authorization-Token is generated by the PCF.

8. The Authorization-Token is included in the SDP message. P-CSCF forwards the SDP message to the originating endpoint

9. UE decides the offered set of media streams for this session, and sends the offered SDP to P-CSCF

10-11. After determining the needed resources in step 8, UE initiates the reservation procedures for the resources needed for this session. P-CSCF forwards the offered SDP to S-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.

12. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

13-14x. The terminating end point responds to the offered SDP with an answer and P-CSCF validates that the resources are allowed to be used.

15. The answered SDP is forwarded to the UE.

16. When the resource reservation is completed, UE sends the successful Resource Reservation message to the terminating endpoint, via the signalling path established by the INVITE message. The message is sent first to P-CSCF.

17. P-CSCF forwards this message to S-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.

18. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

19-20x. The terminating end point responds to the offered SDP with an answer and P-CSCF validates that the resources are allowed to be used.

21. P-CSCF forwards this message to the UE.

22-24. Terminating end point may generate ringing and it is then forwarded via the session path to the UE.

25. UE indicates to the originating ~~subscriber~~ user that the destination is ringing

26. When the destination party answers, the terminating endpoint sends a SIP 200-OK final response, as specified by the termination procedures and the S-S procedures, to S-CSCF.

27. S-CSCF performs whatever service control is appropriate for the completed session setup.

27. S-CSCF sends a SIP 200-OK final response along the signalling path back to P-CSCF. Based on the choice made in (2) above, this response may either be sent directly from S-CSCF to P-CSCF (choice (a)), or be sent indirectly through I-CSCF(THIG) (choice (b)).

28. P-CSCF indicates the resources reserved for this session should now be approved for use.

29. P-CSCF sends a SIP 200-OK final response to the session originator

30. UE starts the media flow(s) for this session

31. UE responds to the 200 OK with a SIP ACK message, which is sent to P-CSCF.

32. P-CSCF forwards the final ACK message to S-CSCF. This may possible be routed through the I-CSCF depending on operator configuration of the I-CSCF.

33. S-CSCF forwards the final ACK message to the terminating endpoint, per the S-S procedure.

next modified section

### 5.6.2 (MO#2) Mobile origination, home

This origination procedure applies to ~~subscribers~~ users located in their home service area.

The UE is located in the home network, and determines the P-CSCF via the CSCF discovery procedure described in section 5.1.1. During registration, the home network allocates an S-CSCF in the home network.

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

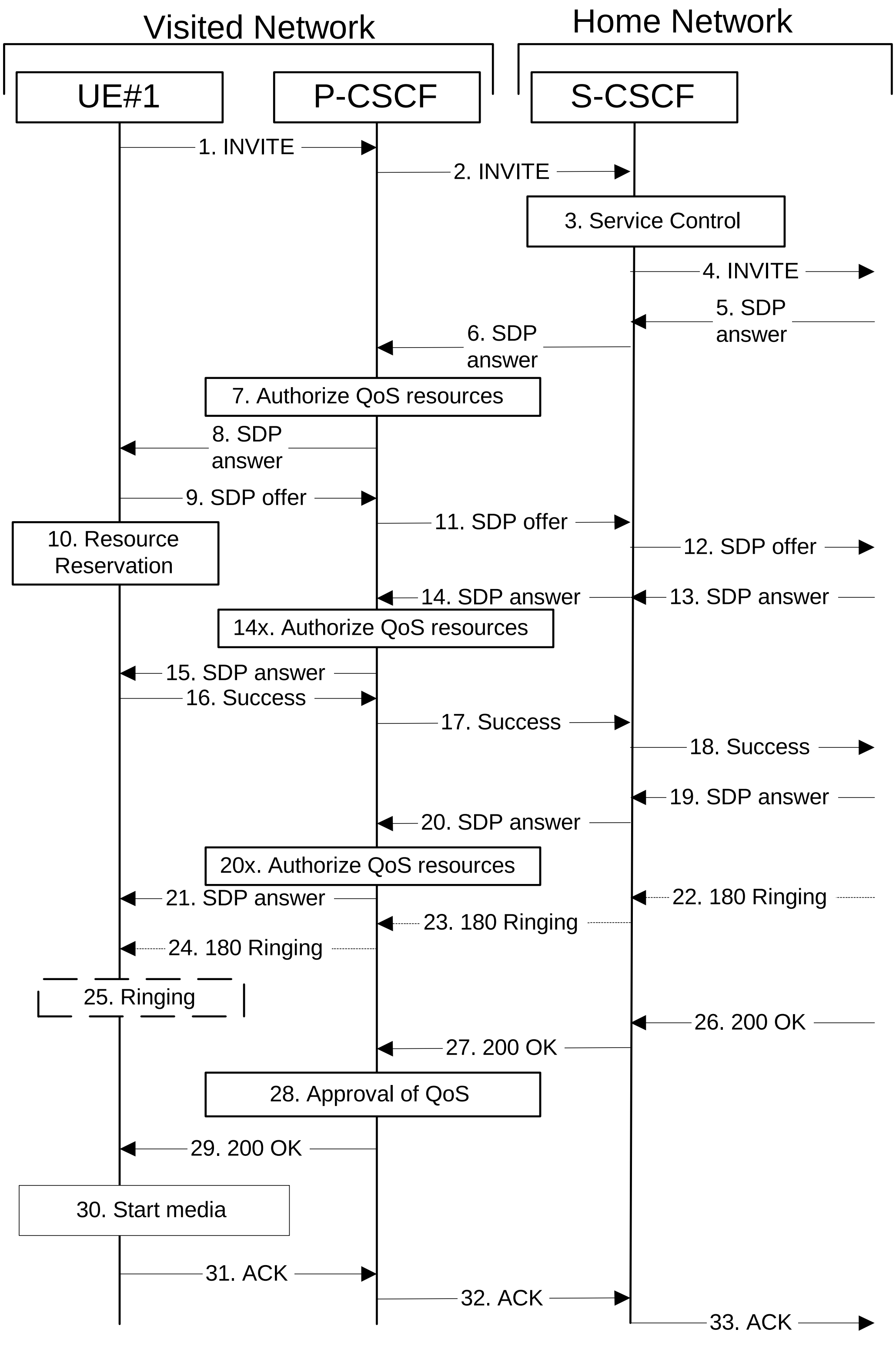


**Figure 5.15: Mobile origination procedure - home**

Procedure MO#2 is as follows:

1. UE#1 sends the SIP 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 multi-media session.

2. P-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. In this case it forwards the INVITE to the S-CSCF in the home network.

3. S-CSCF validates the service profile, and performs any origination service control required for this ~~subscriber~~user. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

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

5. The media stream capabilities of the destination are returned along the signalling path, per the S-S procedures.

6. S-CSCF forwards the SDP message to P-CSCF

7. P-CSCF authorises the resources necessary for this session. The Authorization-Token is generated by the PCF.

8. The Authorization-Token is included in the SDP message. P-CSCF forwards the SDP message to the originating endpoint.

9. UE decides the offered set of media streams for this session, and sends the offered SDP to P-CSCF.

10. UE initiates resource reservation for the offered media.

11. P-CSCF forwards this message to S-CSCF

12. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

13-14x. The terminating end point answers to the offered media and PCSCF authorises the media.

15. PCSCF forwards the answered media towards the UE.

16. When the resource reservation is completed, UE sends the successful Resource Reservation message to the terminating endpoint, via the signalling path established by the INVITE message. The message is sent first to P-CSCF.

17. P-CSCF forwards this message to S-CSCF.

18. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

19-20x. The terminating end point answers to the offered media and PCSCF authorises the media.

21. PCSCF forwards the answered media to the UE.

22. The destination UE may optionally perform alerting. If so, it signals this to the originating party by a provisional response indicating Ringing. This message is sent to S-CSCF per the S-S procedure.

23. S-CSCF forwards this message to P-CSCF.

24. P-CSCF forwards the ringing message to UE.

25. UE indicates to the originating ~~subscriber~~ user that the destination is ringing.

26. When the destination party answers, the terminating endpoint sends a SIP 200-OK final response, as specified by the termination procedures and the S-S procedures, to S-CSCF.

27. S-CSCF passes the 200-OK response back to P-CSCF, following the path of the INVITE request of step (2) above.

28. P-CSCF indicates the resources reserved for this session should now be approved for use.

29. P-CSCF passes the 200-OK response back to UE

30. UE starts the media flow(s) for this session.

31. UE responds to the 200 OK with an ACK message which is sent to P-CSCF.

32. P-CSCF forwards the final ACK message to S-CSCF.

33. S-CSCF forwards the final ACK message to the terminating endpoint, per the S-S procedure.

next modified section

## 5.7.1 (MT#1) Mobile termination, roaming

This termination procedure applies to roaming ~~subscribers~~users.

The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure described in section 5.1.1. The home network advertises either the S-CSCF, or an I-CSCF(THIG), as the entry point from the visited network.

When registration is complete, S-CSCF knows the name/address of its next hop in the signalling path, either I-CSCF or P-CSCF, I-CSCF (if it exists) knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.

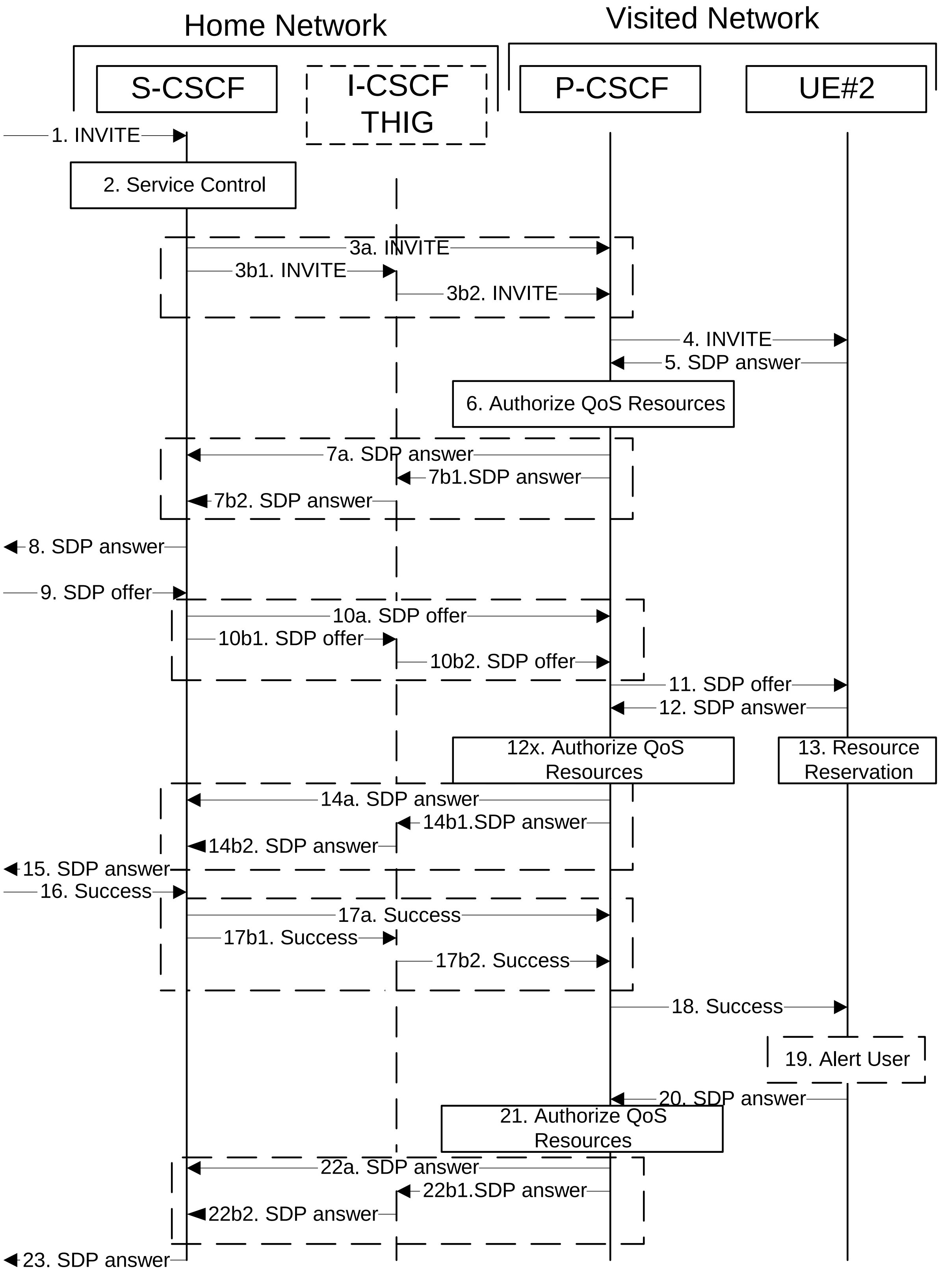


**Figure 5.17-1: Mobile termination procedure - roaming (part 1)**

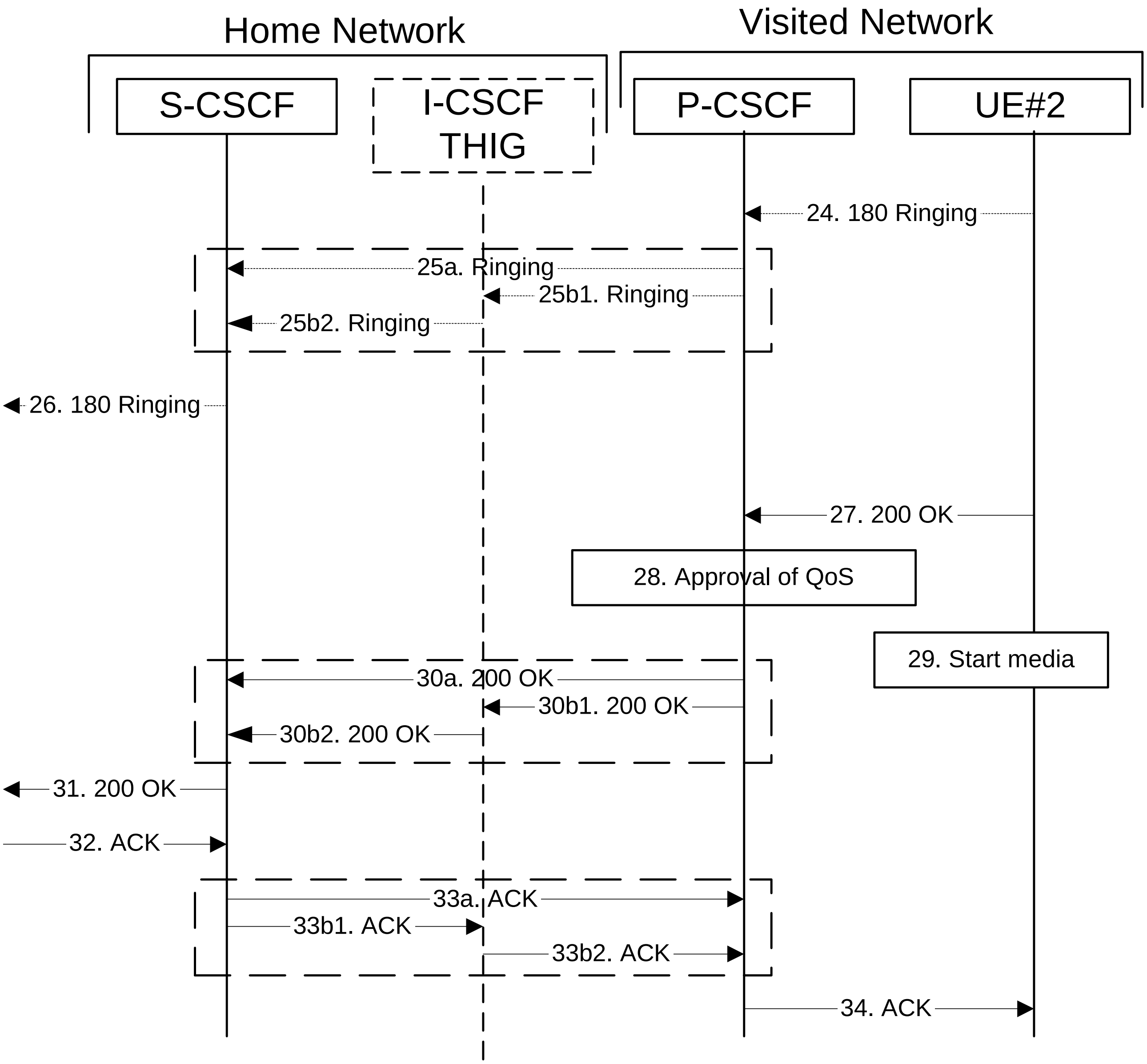


**Figure 5.17-2: Mobile termination procedure - roaming (part 2)**

Procedure MT#1 is as follows:

1. The originating party sends the SIP INVITE request, via one of the origination procedures, and via one of the Inter-Serving procedures, to the Serving-CSCF for the terminating ~~subscriber~~users.

2. S-CSCF validates the service profile, and performs any termination service control required for this ~~subscriber~~user. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

3. S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF in the visited network, possibly through an I-CSCF.

   This next hop is either the P-CSCF that is serving the visiting UE (choice (a)), or an I-CSCF(THIG) within the home network that is performing the configuration hiding function for the home network operator (choice (b)).

   (3a) If the home network operator does not desire to keep their network configuration hidden, the INVITE request is forwarded directly to the P-CSCF.

(3b) If the home network operator desires to keep their network configuration hidden, the INVITE request is forwarded through an I-CSCF(THIG) to the P-CSCF.

(3b1) S-CSCF forwards the INVITE request to I-CSCF(THIG)

(3b2) I-CSCF(THIG) forwards the INVITE request to P-CSCF

4. The Authorization-Token is generated by the PCFand included in the INVITE message. P-CSCF remembers (from the registration procedure) the UE address, and forwards the INVITE to the UE.

5. UE determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with an SDP message back to the originator. This SDP may represent one or more media for a multi-media session. This response is sent to P-CSCF.

6. P-CSCF authorises the resources necessary for this session.

7. P-CSCF forwards the SDP message to S-CSCF. Based on the choice made in step #3 above, this may be sent directly to S-CSCF (7a) or may be sent through I-CSCF(THIG) (7b1 and 7b2).

8. S-CSCF forwards the SDP message to the originator, per the S-S procedure.

9. The originating endpoint sends the offered SDP to be used in this session, via the S-S procedure, to S-CSCF.

10. S-CSCF forwards the offered SDP to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.

11. P-CSCF forwards the offered SDP to UE.

12-12x. UE responds to the offered resources and PCSCF authorises the resources.

13. UE initiates the reservation procedures for the resources needed for this session.

14-15. PCSCF forwards the resource answer to the SCSCF and then to the originating end point via session path.

16. When the originating endpoint has completed its resource reservation, it sends the successful Resource Reservation message to S-CSCF, via the S-S procedures.

17. S-CSCF forwards the message to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.

18. P-CSCF forwards the message to UE.

19. UE#2 alerts the destination ~~subscriber~~ user of an incoming session setup attempt.

20-23. UE#2 responds to the successful resource reservation towards the originating end point.

24. UE may alert the user and wait for an indication from the user before completing the session setup. If so, it indicates this to the originating party by a provisional response indicating Ringing. This message is sent to P-CSCF.

25. P-CSCF forwards the Ringing message to S-CSCF. Based on the choice made in step #3 above, this may be sent directly to S-CSCF (18a) or may be sent through I-CSCF(THIG) (18b1 and 18b2).

26. S-CSCF forwards this message to the originating endpoint, per the S-S procedure.

27. When the destination party answers, the UE sends a SIP 200-OK final response to P-CSCF.

28. P-CSCF indicates the resources reserved for this session should now be committed.

29. UE starts the media flow(s) for this session

30. P-CSCF sends a SIP 200-OK final response along the signalling path back to the S-CSCF
Based on the choice made in (3) above, this response may either be sent directly from P-CSCF to S-CSCF (choice (a)), or be sent indirectly through the I-CSCF(THIG) (choice (b)).

31. S-CSCF forwards the SIP 200-OK final response along the signalling path back to the session originator, as per the S-S procedure.

32. The originating party responds to the 200-OK final response with a SIP ACK message that is sent to S-CSCF via the S-S procedure.

33. S-CSCF forwards the SIP ACK message to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.

34. P-CSCF forwards the ACK message to UE.

next modified section

### 5.7.2 (MT#2) Mobile termination, home

This termination procedure applies to ~~subscribers~~ users located in their home service area.

The UE is located in the home network, and determines the P-CSCF via the CSCF discovery procedures described in section 5.1.1.

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

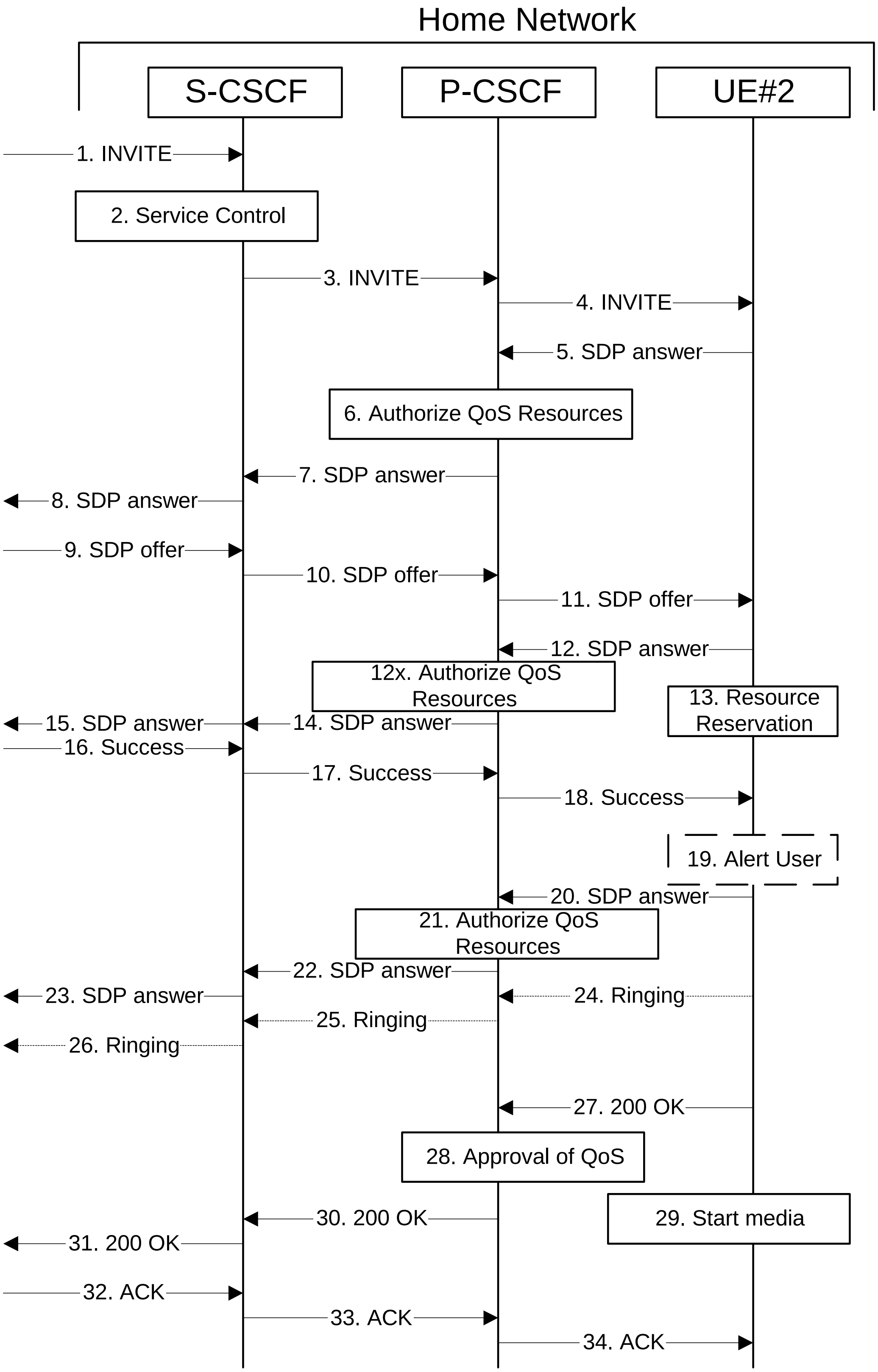


**Figure 5.18: Mobile termination procedure - home**

Procedure MT#2 is as follows:

1. UE#1 sends the SIP INVITE request, via one of the origination procedures, and via one of the Serving to Serving-CSCF procedures, to the Serving-CSCF for the terminating ~~subscriber~~user.

2. S-CSCF validates the service profile, and performs any termination service control required for this ~~subscriber~~user. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

3. S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF in the home network.

4. The Authorization-Token is generated by the PCF and included in the INVITE message. P-CSCF remembers (from the registration procedure) the UE address, and forwards the INVITE to the UE.

5. UE determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with an SDP message back to the originator. This SDP may represent one or more media for a multi-media session. This response is sent to P-CSCF.

6. P-CSCF authorises the resources necessary for this session.

7. P-CSCF forwards the SDP message to S-CSCF.

8. S-CSCF forwards the SDP message to the originator, per the S-S procedure.

9. The originating endpoint sends the offered SDP to be used in this session, via the S-S procedure, to S-CSCF.

10. S-CSCF forwards the offered SDP to P-CSCF.

11. P-CSCF forwards the offered SDP to UE.

12-12x. UE responds to the offered SDP and P-CSCF authorises the response.

13. UE initiates the reservation procedures for the resources needed for this session.

14-15. The response is forwarded to the originating end point.

16. When the originating endpoint has completed its resource reservation, it sends the successful Resource Reservation message to S-CSCF, via the S-S procedures.

17. S-CSCF forwards the message to P-CSCF.

18. P-CSCF forwards the message to UE.

19. UE#2 alerts the destination ~~subscriber~~ user of an incoming session setup attempt.

20-23. UE#2 responds to the successful resource reservation and P-CSCF authorises the possible response offer and the message is forwarded to the originating end.

24. UE may alert the user and wait for an indication from the user before completing the session. If so, it indicates this to the originating party by a provisional response indicating Ringing. This message is sent to P-CSCF.

25. P-CSCF forwards the Ringing message to S-CSCF.

26. S-CSCF forwards this message to the originating endpoint, per the S-S procedure.

27. When the destination party answers, UE sends a SIP 200-OK final response to P-CSCF.

28. P-CSCF indicates the resources reserved for this session should now be committed.

29. UE starts the media flow(s) for this session.

30. P-CSCF forwards the 200-OK to S-CSCF, following the path of the INVITE request in step (3) above

31. S-CSCF performs any service control required on session setup completion.

32. S-CSCF forwards the 200-OK final response, as per the appropriate S-S procedure.

33. The session originator responds to the 200-OK by sending the ACK message to S-CSCF via the S-S procedure.

34. S-CSCF forwards the SIP ACK message to P-CSCF.

35. P-CSCF forwards the ACK message to UE.

next modified section

## 5.7.2a (MT#3) Mobile termination, CS Domain roaming

This termination procedure applies to a ~~subscriber~~ user registered for CS services, either in the home network or in a visited network. The ~~subscriber~~ user has both IMS and CS subscriptions but is unregistered for IMS services

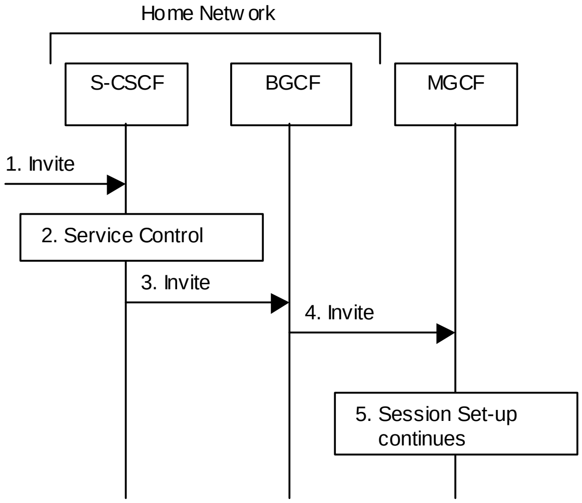


**Figure 5.18a: Mobile Terminating procedures to a ~~subscriber~~ user that is unregistered for IMS services but is registered for CS services**

1. In case the terminating ~~subscriber~~ user does not have an S-CSCF allocated, the session attempt is routed according to the section 5.12.1 (Mobile Terminating procedures to unregistered IMS ~~subscriber~~ user that has services related to unregistered state).

2. S-CSCF invokes service control appropriate for this session setup attempt, which may result in e.g. re-routing the session to a messaging service, or continued routing towards the ~~subscriber's~~ user’s CS domain termination address (e.g. E.164).

3. S-CSCF performs whatever further actions are appropriate for this session setup attempt. In case of routing towards the ~~subscriber's~~ user’s CS domain termination address, the S-CSCF performs an analysis of this address. From the analysis of the destination address, S-CSCF determines that this is for the CS domain, and passes the request to the BGCF.

4. The BGCF forwards the SIP INVITE message to the appropriate MGCF in the home network, or to a BGCF in another network. This depends on the PSTN interworking configuration of the IMS network. Eventually, the session initiation arrives to an MGCF.

5. Normal session setup continues according to PSTN-T flow as described in Section 5.7.3

next modified section

## 5.8 Procedures related to routing information interrogation

The mobile terminated sessions for a ~~subscriber~~ user shall be routed either to a Serving-CSCF or to a MGCF (if the ~~subscriber~~ user is roaming in a legacy network). When a mobile terminated session set-up arrives at a CSCF that is authorised to route sessions, the CSCF interrogates the HSS for routing information.

The Cx reference point shall support retrieval of routing information from HSS to CSCF. The resulting routing information can be either Serving-CSCF signalling transport parameters (e.g. IP-address).

### 5.8.1 User identity to HSS resolution

This section describes the resolution mechanism, which enables the I-CSCF and the S-CSCF to find the address of the HSS, that holds the subscriber data for a given user identity when multiple and separately addressable HSSs have been deployed by the network operator. This resolution mechanism is not required in networks that utilise a single HSS e.g. optionally, it could be switched off on the I-CSCF and on the S-CSCF using O&M mechanisms. An example for a single HSS solution is a server farm architecture. By default, the resolution mechanism shall be supported.

On REGISTER and on MT INVITEs, the I-CSCF queries the HSS for ~~subscriber~~ user's subscription specific data, e. g. the actual location or authentication parameters. This also has to be accomplished by the S-CSCF on REGISTER. In the case when more than one independently addressable HSS is utilized by a network operator, the HSS where user information for a given subscriber is available has to be found. To get the HSS name the I-CSCF and the S-CSCF query the Subscription Locator Functional (SLF) entity.

The subscription locator is accessed via the Dx interface. The Dx interface is the standard interface between the CSCF and the SLF.

A way to use the subscription locator is described in the following.

The Dx interface provides:

- an operation to query the subscription locator from the I-CSCF or from the S-CSCF, respectively
- a response to provide the HSS name towards the I-CSCF or towards the S-CSCF, respectively.

By sending the Dx-operation DX_SLF_QUERY the I-CSCF or the S-CSCF indicates a ~~subscriber~~ user identity of which it is looking for an HSS. By the Dx-operation DX_SLF_RESP the SLF responds with the HSS name. The I-CSCF or the S-CSCF, respectively, continues by querying the selected HSS. As an option at the registration flow, the I-CSCF may forward the HSS name towards the serving CSCF to simplify the procedure by which the serving CSCF finds the subscriber's HSS. This option can be used in a single HSS environment.

The following two sections present the session flows on REGISTER and on INVITE messages.

### 5.8.2 SLF on register

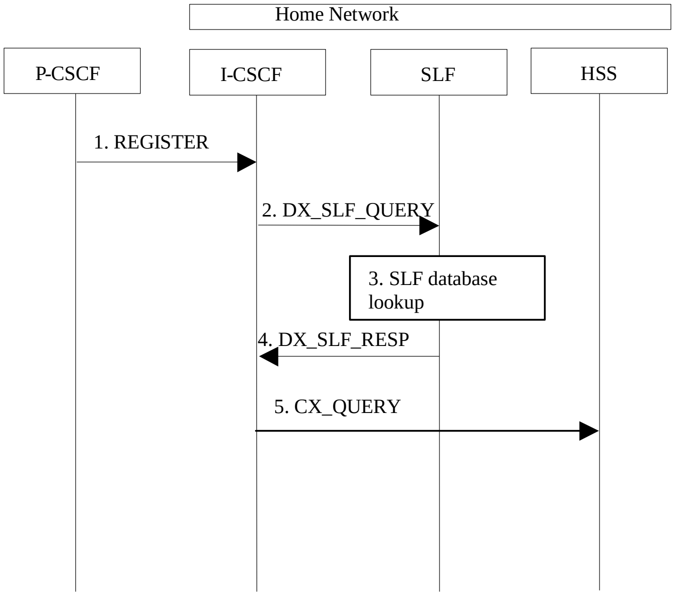


**Figure 5.20: SLF on register (1st case)**

1. I-CSCF receives a REGISTER request and now has to query for the location of the ~~subscriber's~~ user's subscription data.
2. The I-CSCF sends a DX_SLF_QUERY to the SLF and includes as parameter the user~~subscriber~~ identity which is stated in the REGISTER request.
3. The SLF looks up its database for the queried user~~subscriber~~ identity.
4. The SLF answers with the HSS name in which the ~~subscriber's~~ user's subscription data can be found.
5. The I-CSCF can proceed by querying the appropriate HSS.

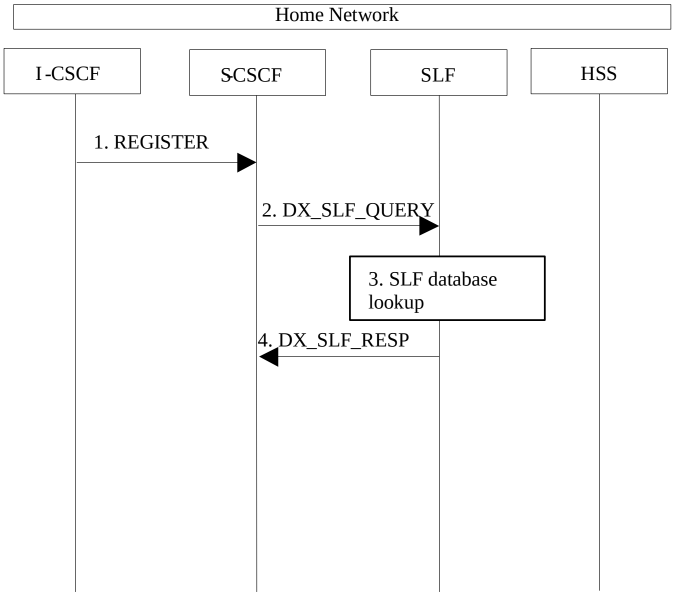


**Figure 5.20a: SLF on register (2nd case)**

1. I-CSCF sends a REGISTER request to the S-CSCF. This now has to query for the location of the ~~subscriber's~~ user's subscription data.

2. The S-CSCF sends a DX_SLF_QUERY to the SLF and includes as parameter the user~~subscriber~~ identity which is stated in the REGISTER request.

3. The SLF looks up its database for the queried user~~subscriber~~ identity.

4. The SLF answers with the HSS name in which the user's subscription~~subscriber's~~ data can be found.

### 5.8.3 SLF on UE invite

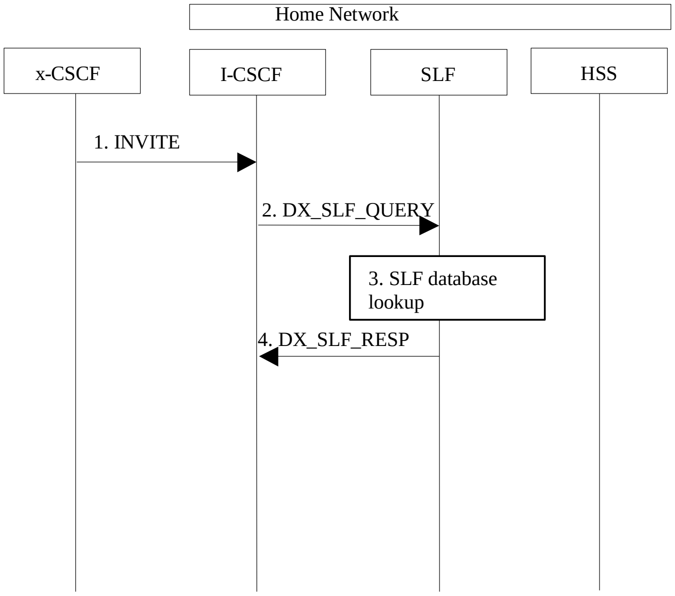


**Figure 5.21: SLF on UE invite**

1. I-CSCF receives an INVITE request and now has to query for the location of the ~~subscriber's~~ user´s subscription data.

2. The I-CSCF sends a DX_SLF_QUERY to the HSS and includes as parameter the user~~subscriber~~ identity which is stated in the INVITE request.

3. The SLF looks up its database for the queried user~~subscriber~~ identity.

4. The SLF answers with the HSS name in which the ~~subscriber's~~ user's subscription data can be found.

The synchronisation between the SLF and the different HSSs is an O&M issue.

To prevent an SLF service failure e.g. in the event of a server outage, the SLF could be distributed over multiple servers. Several approaches could be employed to discover these servers. An example is the use of the DNS mechanism in combination with a new DNS SRV record. The specific algorithm for this however does not affect the basic SLF concept and is outside the scope of this document.

next modified section

## 5.11.1 Session Hold and Resume Procedures

This section gives information flows for the procedures for placing sessions on hold that were previously established by the mechanisms of sections 5.4, 5.5, 5.6, and 5.7, and resuming the session afterwards. Two cases are presented: mobile-to-mobile (UE-UE), and a UE-initiated hold of a UE-PSTN session.

For a multi-media session, it shall be possible to place a subset of the media streams on hold while maintaining the others.

These procedures do not show the use of optional I-CSCFs. If an I-CSCF was included in the signalling path during the session establishment procedure, it would continue to be used in any subsequent flows such as the ones described in this section.

### 5.11.1.1 Mobile-to-Mobile Session Hold and Resume Procedures

An IMS session was previously established between an initiating UE and a terminating UE. Each of these UEs has an associated P-CSCF in the same network as their GGSNs are located, and a S-CSCF assigned in their home network. These functional elements co-operate to clear the session, and the procedures are independent of whether they are located in the home or visited networks.

The hold and resume procedures are identical whether the UE that initiated the session also initiates the session-hold, or whether the UE that terminated the session initiates the session-hold.

When a media stream has been placed on hold, it shall not be resumed by any endpoint other than the one that placed it on hold.

The procedures for placing a media stream on hold, and later resuming the media stream, are as shown in the following information flow:

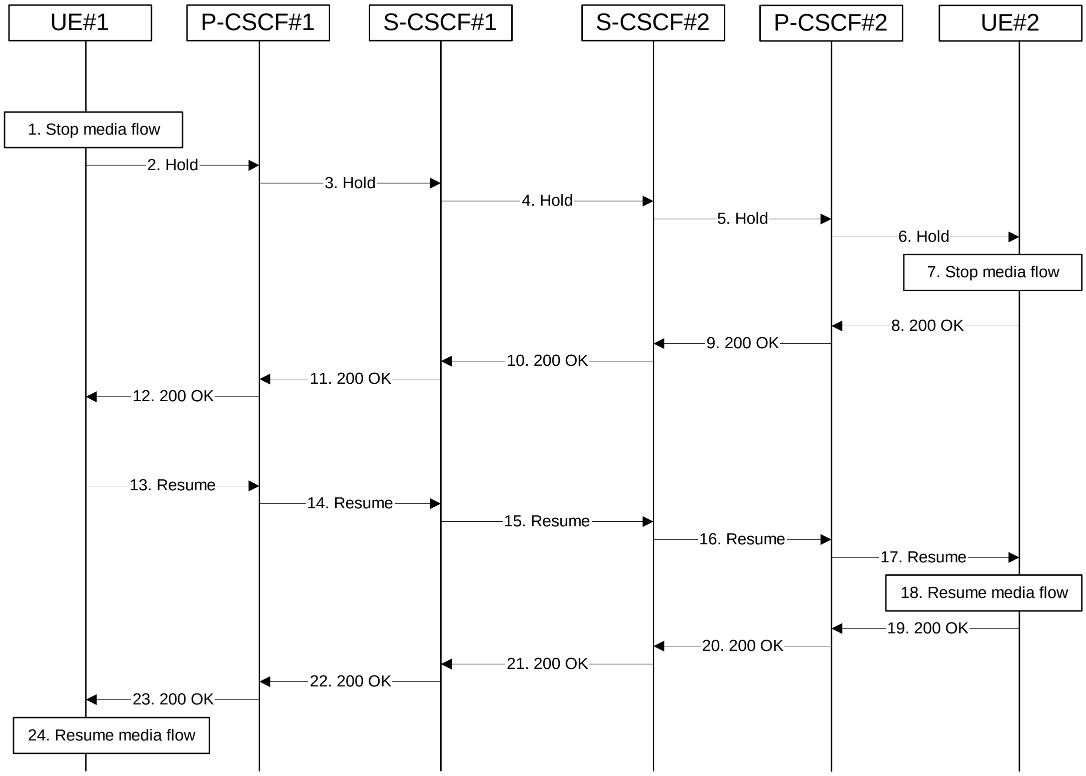


**Figure 5.28: Mobile to Mobile session hold and resume**

Information flow procedures are as follows:

1. UE#1 detects a request from the ~~subscriber~~ user to place a media stream on hold. UE#1 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.

2. UE#1 sends a Hold message to its proxy, P-CSCF#1.
3. P-CSCF#1 forwards the Hold message to S-CSCF#1.
4. S-CSCF#1 forwards the Hold message to S-CSCF#2.
5. S-CSCF#2 forwards the Hold message to P-CSCF#2.
6. P-CSCF#2 forwards the Hold message to UE#2.
7. UE#2 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.
8. UE#2 acknowledges receipt of the Hold message with a 200-OK final response, send to P-CSCF#2.
9. P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.
10. S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.
11. S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.
12. P-CSCF#1 forwards the 200 OK final response to UE#1.
13. UE#1 detects a request from the user~~subscriber~~ to resume the media stream previously placed on hold. UE#1 sends a Resume message to its proxy, P-CSCF#1.
14. P-CSCF#1 forwards the Resume message to S-CSCF#1.
15. S-CSCF#1 forwards the Resume message to S-CSCF#2.
16. S-CSCF#2 forwards the Resume message to P-CSCF#2.
17. P-CSCF#2 forwards the Resume message to UE#2.
18. UE#2 resumes sending the media stream to the remote endpoint.
19. UE#2 acknowledges receipt of the Resume message with a 200-OK final response, sent to P-CSCF#2.
20. P-CSCF#2 forwards the 200 OK final response to S-CSCF#2.
21. S-CSCF#2 forwards the 200 OK final response to S-CSCF#1.
22. S-CSCF#1 forwards the 200 OK final response to P-CSCF#1.
23. P-CSCF#1 forwards the 200 OK final response to UE#1.
24. UE#1 resumes sending the media stream to the remote endpoint.

### 5.11.1.2 Mobile-initiated Hold and Resume of a Mobile-PSTN Session

An IMS session was previously established between an initiating UE and a MGCF acting as a gateway for a session terminating on the PSTN, or between an initiating MGCF acting as a gateway for a session originating on the PSTN to a terminating UE. The UE has an associated P-CSCF in the same network as its GGSN is located, an S-CSCF assigned in its home network, and a BGCF that chooses the MGCF. These functional elements co-operate to clear the session, and the procedures are independent of whether they are located in the subscriber's home or visited networks. Therefore there is no distinction in this section of home network vs. visited network.

The session hold and resume procedure is similar whether the UE initiated the session to the PSTN, or if the PSTN initiated the session to the UE. The only difference is the optional presence of the BGCF in the case of a session initiated by the UE. Note that the BGCF might or might not be present in the signalling path after the first INVITE is routed.

The procedures for placing a media stream on hold, and later resuming the media stream, are as shown in the following information flow:

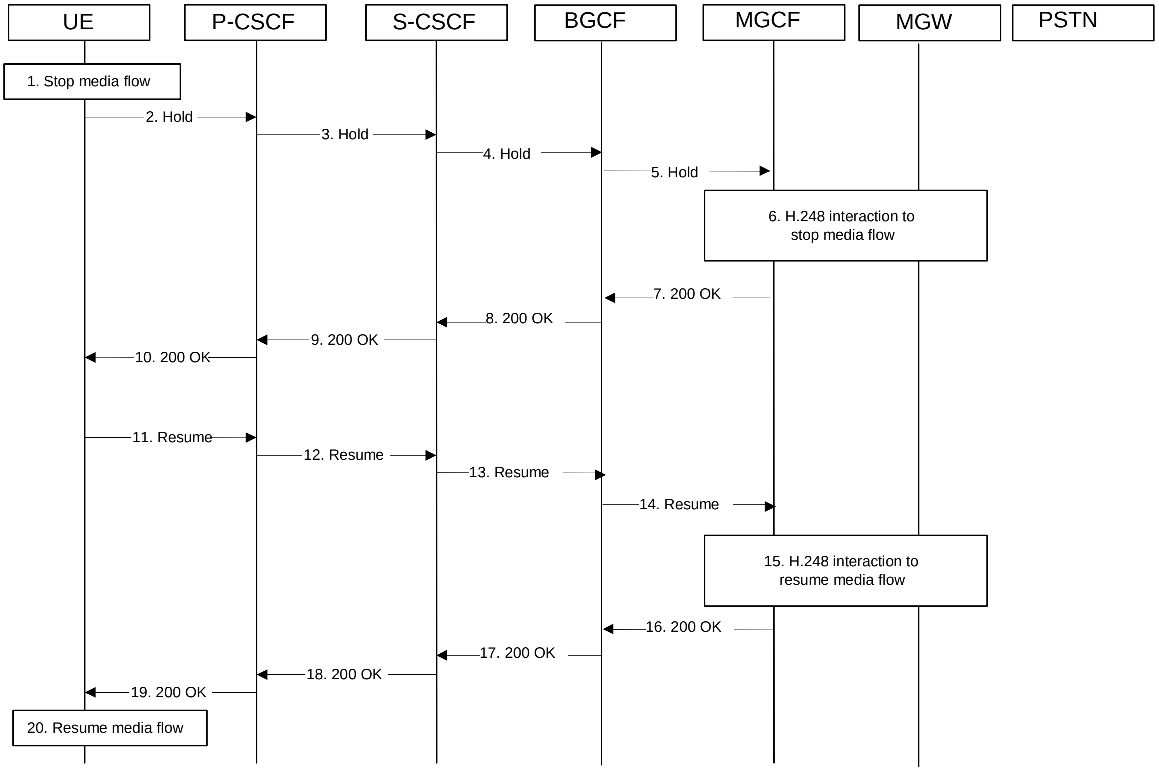


**Figure 5.29: Mobile to PSTN session hold and resume**

Information flow procedures are as follows:

1. UE detects a request from the ~~subscriber~~ user to place a media stream on hold. UE#1 stops sending the media stream to the remote endpoint, but keeps the resources for the session reserved.

2. UE sends a Hold message to its proxy, P-CSCF.

3. P-CSCF forwards the Hold message to S-CSCF.

4. S-CSCF forwards the Hold message to BGCF.

5. BGCF forwards the Hold message to MGCF.

6. MGCF initiates a H.248 interaction with MGW instructing it to stop sending the media stream, but to keep the resources for the session reserved.

7. MGCF acknowledges receipt of the Hold message with a 200-OK final response, send to BGCF.

8. BGCF forwards the 200-OK to the S-CSCF.

9. S-CSCF forwards the 200 OK final response to P-CSCF.

10. P-CSCF forwards the 200 OK final response to UE.

11. UE detects a request from the ~~subscriber~~ user to resume the media stream previously placed on hold. UE sends a Resume message to its proxy, P-CSCF.

12. P-CSCF forwards the Resume message to S-CSCF.

13. S-CSCF forwards the Resume message to BGCF.

14. BGCF forwards the Resume message to MGCF.

15. MGCF initiates a H.248 interaction with MGW instructing it to resume sending the media stream.

16. MGCF acknowledges receipt of the Resume message with a 200-OK final response, sent to BGCF.

17. BGCF forwards the 200 OK final response to the S-CSCF.

18. S-CSCF forwards the 200 OK final response to P-CSCF.

19. P-CSCF forwards the 200 OK final response to UE.

20. UE resumes sending the media stream to the remote endpoint.

next modified section

## 5.11.2 Procedures for anonymous session establishment

This section gives information flows for the procedures for an anonymous session. However, sessions are not intended to be anonymous to the originating or terminating network operators.

### 5.11.2.1 Signalling requirements for anonymous session establishment

If the ~~subscriber~~ user requests the session to be anonymous, the UE must not reveal any identity information other than that required in the Remote-Party-ID header.

If the originating ~~subscriber~~ user requests the session to be anonymous, the terminating side must not reveal any identity or signalling routing information to the destination endpoint. The terminating network should distinguish at least two cases, first where the originator intended the session to be anonymous, and second where the originator's identity was deleted by a transit network.

### 5.11.2.2 Bearer path requirements for anonymous session establishment

Procedures for establishment of an anonymous bearer path are not standardised in this release.

next modified section

## 5.11.3 Procedures for codec and media characteristics flow negotiations

This section gives information flows for:

- the procedures for determining the set of negotiated characteritics between the endpoints of a multi-media session, determining the initial media characteristics (including common codecs) to be used for the multi-media session, and

- the procedures for modifying a session within the existing resources reservation or with a new resources reservation (adding/deleting a media flow, changing media characteristics including codecs, changing bandwidth requirements) when the session is already established.

### 5.11.3.1 Codec and media characteristics flow negotiation during initial session establishment

Initial session establishment in the IM CN subsystem must determine a negotiated set of media characteristics (including a common codec or set of common codecs for multi-media sessions) that will be used for the session. This is done through an end-to-end message exchange to determine the complete set of media characteristics, then the decision is made by the session initiator as to the initial set of media flows.

The session initiator includes an SDP in the SIP INVITE message that lists every media characteristics (including codecs) that the originator is willing to support for this session. When the message arrives at the destination endpoint, it responds with the media characteristics (e.g. common subset of codecs) that it is also willing to support for the session.

Media authorisation is performed for these media characteristics. The session initiator, upon receiving the common subset, determines the media characteristics (including codecs) to be used initially.

The negotiation may take multiple media offered and answered between the end points until the media set is agreed upon.

Once the session is established, the procedures of section 5.11.3.2 may be used by either endpoint to change to a different media characteristic (e.g. codec) that was included in the initial session description, and for which no additional resources are required for media transport. The procedures of section 5.11.3.3 may be used by either endpoint to change the session, which requires resources beyond those allocated to the existing session.

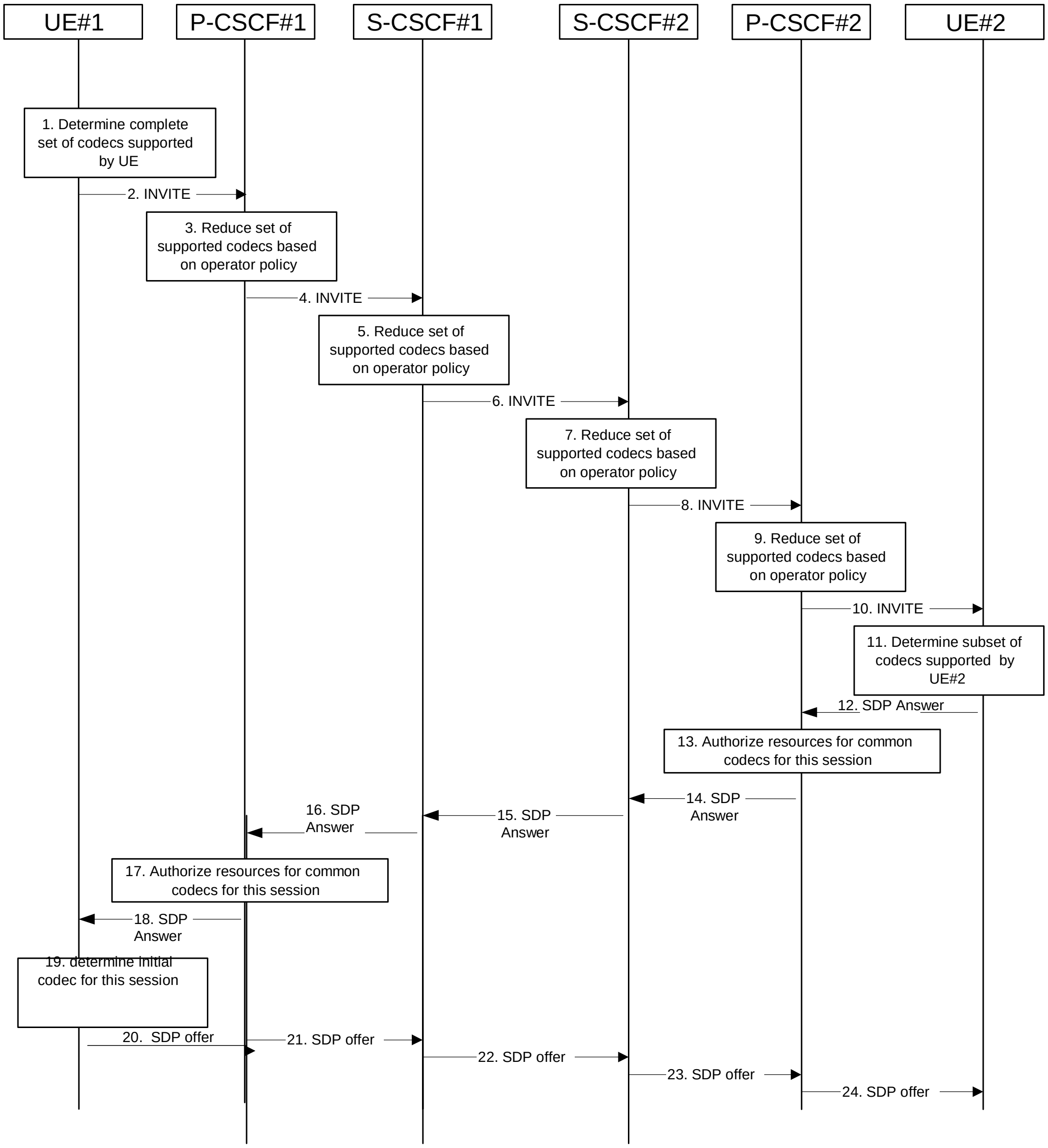

UE#1
P-CSCF#1
S-CSCF#1
S-CSCF#2
P-CSCF#2
UE#2
1. Determine complete set of codecs supported by UE
2. INVITE
3. Reduce set of supported codecs based on operator policy
4. INVITE
5. Reduce set of supported codecs based on operator policy
6. INVITE
7. Reduce set of supported codecs based on operator policy
8. INVITE
9. Reduce set of supported codecs based on operator policy
10. INVITE
11. Determine subset of codecs supported by UE#2
12. SDP Answer
13. Authorize resources for common codecs for this session
14. SDP Answer
15. SDP Answer
16. SDP Answer
17. Authorize resources for common codecs for this session
18. SDP Answer
19. determine initial codec for this session
20. SDP offer
21. SDP offer
22. SDP offer
23. SDP offer
24. SDP offer

**Figure 5.30: Codec negotiation during initial session establishment**

The detailed procedure is as follows:

1. UE#1 inserts the codec(s) to a SDP payload. The inserted codec(s) shall reflect the UE#1's terminal capabilities and user preferences for the session. 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.

2. UE#1 sends the initial INVITE message to P-CSCF#1 containing this SDP
3. P-CSCF#1 examines the media parameters, and removes any choices that the nework operator decides based on local policy, not to allow on the network.
4. P-CSCF#1 forwards the INVITE message to S-CSCF#1
5. S-CSCF#1 examines the media parameters, and removes any choices that the ~~subscriber~~ user does not have authority to request. As part of the S-CSCF session processing an 'application server' may be involved. When an 'application server' is involved the application server may also examine the media parameters and revise the session description.
6. S-CSCF#1 forwards the INVITE, through the S-S Session Flow Procedures, to S-CSCF#2
7. S-CSCF#2 examines the media parameters, and removes any choices that the destination ~~subscriber~~ user does not have authority to request. As part of the S-CSCF session processing an 'application server' may be involved. When an 'application server' is involved the application server may also examine the media parameters and revise the session description.
8. S-CSCF#3 forwards the INVITE message to P-CSCF#2.
9. 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. The Authorization-Token is generated by the PCF.
10. The Authorization-Token is included in the INVITE message. P-CSCF#2 forwards the INVITE message to UE#2
11. UE#2 determines the complete set of codecs that it is capable of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE message. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.
12. UE#2 returns the SDP listing common media flows and codecs to P-CSCF#2
13. P-CSCF#2 authorises the QoS resources for the remaining media flows and codec choices.
14. P-CSCF#2 forwards the SDP response to S-CSCF#2.
15. S-CSCF#2 forwards the SDP response to S-CSCF#1
16. S-CSCF#1 forwards the SDP response to P-CSCF#1
17. P-CSCF#1 authorises the QoS resources for the remaining media flows and codec choices. The Authorization-Token is generated by the PCF.
18. The Authorization-Token is included in the SDP message. P-CSCF#1 forwards the SDP response to UE#1
19. UE#1 determines which media flows should be used for this session, and which codecs should be used for each of those media flows. If there was more than one media flow, or if there was more than one choice of codec for a media flow, then UE#1 need to renegotiate the codecs by sending another offer to reduce codec to one with the UE#2.

20-24. UE#2 sends the "Offered SDP" message to UE#1, along the signalling path established by the INVITE request

The remainder of the multi-media session completes identically to a single media/single codec session, if the negotiation results in a single codec per media.

#### 5.11.3.2 Codec or media characteristics flow change within the existing reservation

After the multi-media session is established, it is possible for either endpoint to change the set of media flows or media characteristics (e.g. codecs) for media flows. If the change is within the resources already reserved, then it is only necessary to synchronise the change with the other endpoint. Note that an admission control decision will not fail if the new resource request is within the existing reservation.

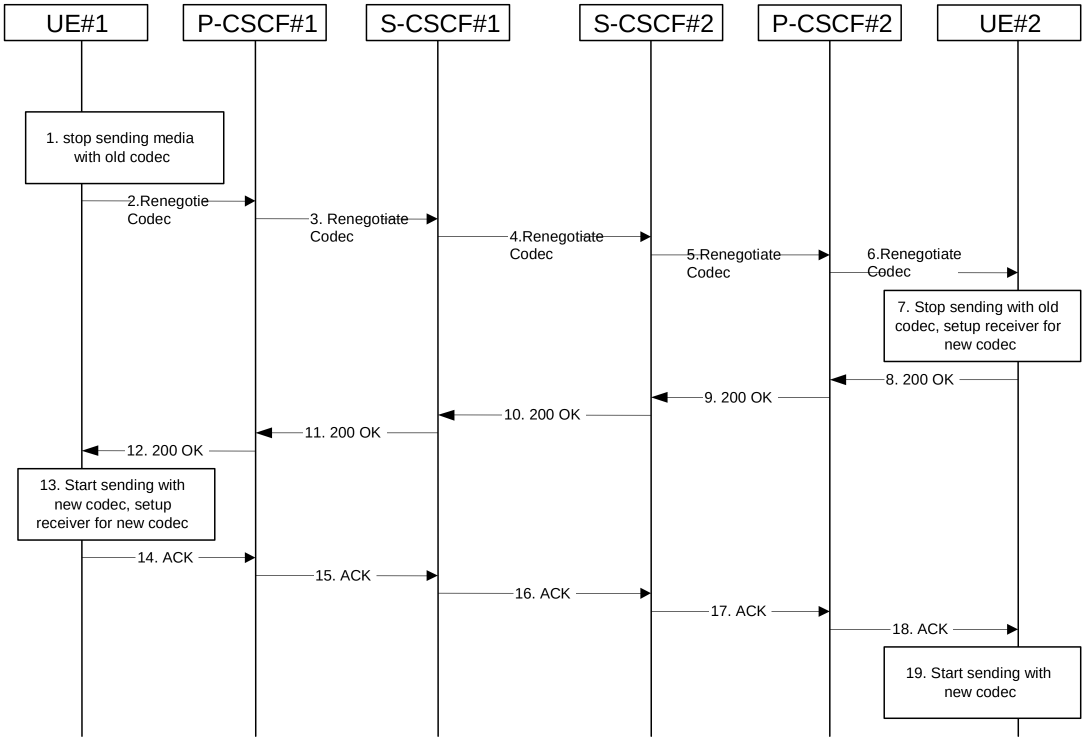


**Figure 5.31: Codec or media flow change - same reservation**

The detailed procedure is as follows:

1. 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.

2-6. UE#1 sends an INVITE message through the signalling path to UE#2. At each step along the way, the CSCFs recognise the SDP is a proper subset of that previously authorised, and take no further action.

7. UE#2 receives the INVITE message, and agrees that it is a change within the previous resource reservation. (If not, it would respond with a SDP message, following the procedures of 5.11.3.1). UE#2 stops sending the media streams to be deleted, and initialises its media receivers for the new codec.

8-12. UE#2 forwards a 200-OK final response to the INVITE message along the signalling path back to UE#1.

13. UE#1 starts sending media using the new codecs. UE#1 also releases any excess resources no longer needed.

14-18. UE#1 sends the SIP final acknowledgement, ACK, to UE#2.

19. UE#2 starts sending media using the new codecs. UE#2 also releases any excess resources no longer needed

### 5.11.3.3 Codec or media characteristics flow change requiring new resources and/or authorisation

After the multi-media session is established, it is possible for either endpoint to change the set of media flows or media characteristics (e.g. codecs) for media flow(s). If the change requires different 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 multi-media session remains in progress.

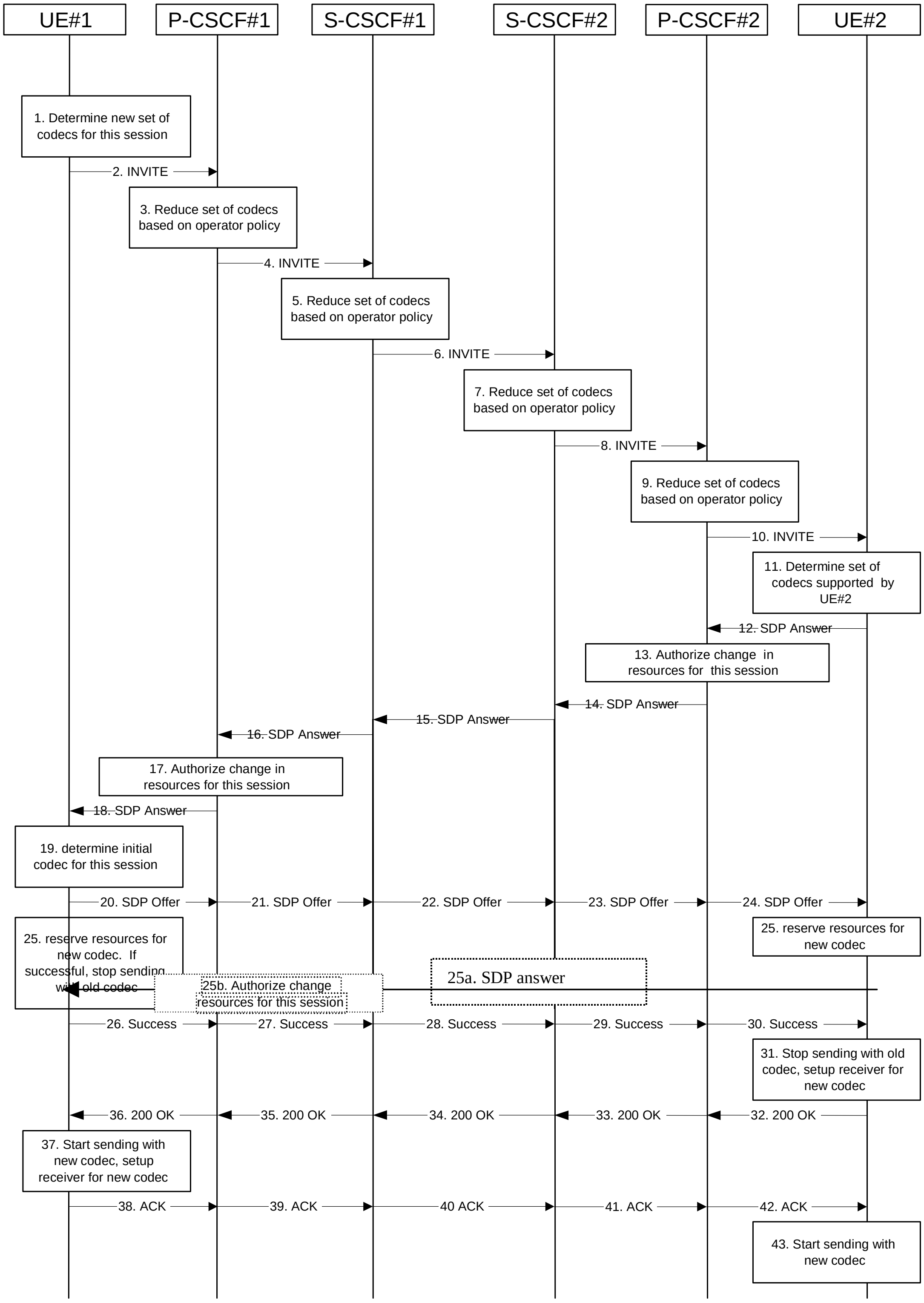

UE#1
P-CSCF#1
S-CSCF#1
S-CSCF#2
P-CSCF#2
UE#2
1. Determine new set of codecs for this session
2. INVITE
3. Reduce set of codecs based on operator policy
4. INVITE
5. Reduce set of codecs based on operator policy
6. INVITE
7. Reduce set of codecs based on operator policy
8. INVITE
9. Reduce set of codecs based on operator policy
10. INVITE
11. Determine set of codecs supported by UE#2
12. SDP Answer
13. Authorize change in resources for this session
14. SDP Answer
15. SDP Answer
16. SDP Answer
17. Authorize change in resources for this session
18. SDP Answer
19. determine initial codec for this session
20. SDP Offer
21. SDP Offer
22. SDP Offer
23. SDP Offer
24. SDP Offer
25. reserve resources for new codec. If successful, stop sending with old codec
25. reserve resources for new codec
25a. SDP answer
25b. Authorize change resources for this session
26. Success
27. Success
28. Success
29. Success
30. Success
31. Stop sending with old codec, setup receiver for new codec
36. 200 OK
35. 200 OK
34. 200 OK
33. 200 OK
32. 200 OK
37. Start sending with new codec, setup receiver for new codec
38. ACK
39. ACK
40 ACK
41. ACK
42. ACK
43. Start sending with new codec

**Figure 5.32: Codec or media flow change - new reservation**

The detailed procedure is as follows:

1. UE#1 inserts the revised set of codecs to a SDP payload. The inserted codec(s) shall reflect the UE#1's terminal capabilities and user preferences for the 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.

2. UE#1 sends an INVITE message to P-CSCF#1 containing this SDP

3. 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. P-CSCF#1 forwards the INVITE message to S-CSCF#1

5. S-CSCF#1 examines the media parameters, and removes any choices that the ~~subscriber~~ user does not have authority to request. As part of the S-CSCF session processing an ‘application server’ may be involved. When an ‘application server’ is involved the application server may also examine the media parameters and revise the session description.

6. S-CSCF#1 forwards the INVITE, through the S-S Session Flow Procedures, to S-CSCF#2

7. S-CSCF#2 examines the media parameters, and removes any choices that the destination ~~subscriber~~ user does not have authority to request. As part of the S-CSCF session processing an ‘application server’ may be involved. When an ‘application server’ is involved the application server may also examine the media parameters and revise the session description.

8. S-CSCF#3 forwards the INVITE message to P-CSCF#2.

9. P-CSCF#2 examines the media flows and the codec choices, and removes any that the destination network operator decides, based on local policy, not to allow on the network.

10. P-CSCF#2 forwards the INVITE message to UE#2

11. UE#2 determines the complete set of codecs that it is capable of supporting for this session. It determines the intersection with those appearing in the SDP in the INVITE message. For each media flow that is not supported, UE#2 inserts a SDP entry for media (m= line) with port=0. For each media flow that is supported, UE#2 inserts a SDP entry with an assigned port and with the codecs in common with those in the SDP from UE#1.

12. UE#2 returns the SDP listing common media flows and codecs to P-CSCF#2. It may additionally provide more codecs than originally offered and then the offered set need to be renegotiated.

13. P-CSCF#2 increases the authorisation for the QoS resources, if needed, for the remaining media flows and codec choices.

14. P-CSCF#2 forwards the SDP response to S-CSCF#2.

15. S-CSCF#2 forwards the SDP response to S-CSCF#1

16. S-CSCF#1 forwards the SDP response to P-CSCF#1

17. P-CSCF#1 increases the authorisation for the QoS resources, if needed, for the remaining media flows and codec choices.

18. P-CSCF#1 forwards the SDP response to UE#1

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

20-24. UE#1 sends the offered SDP message to UE#2, including the SDP from step #19 if needed.

25. UE#1 and UE#2 reserve the resources needed for the added or changed media flows. If the reservation is successfully completed by UE#1, it stops transmitting any deleted media streams.

25a. If UE#1 has sent an updated offer of SDP in steps 20-24, then UE#2 responds to the offer.

25b. P-CSCF#1 authorises the offered SDP sent by UE#2,

26-30. UE#1 sends the successful Resource Reservation Successful message with final SDP to UE#2, via the signalling path through the CSCFs.

31. UE#2 stops sending the media streams to be deleted, and initialises its media receivers for the new codec.

32-36. UE#2 sends the 200-OK final response to UE#1, along the signalling path

37. UE#1 starts sending media using the new codecs. UE#1 also releases any excess resources no longer needed.

38-40. UE#1 sends the SIP final acknowledgement, ACK, to UE#2 along the signalling path

43. UE#2 starts sending media using the new codecs. UE#2 also releases any excess resources no longer needed

### 5.11.3.4 Sample MM session flow - addition of another media

For this end-to-end session flow, we assume the originator is a UE located within the service area of the network operator to whom the UE is subscribed. The UE has already established an IM CN session and is generating an invite to add another media (e.g., video to a voice call) to the already established session. Note that the invite to add media to an existing session could be originated by either end. The invite, and subsequent flows, are assumed to follow the path determined when the initial session was established. Any I-CSCFs that were included in the initial session would be included in this session.

The originating party addresses a destination that is a subscriber of the same network operator.

The destination party is a UE located within the service area of the network operator to which it is subscribed.

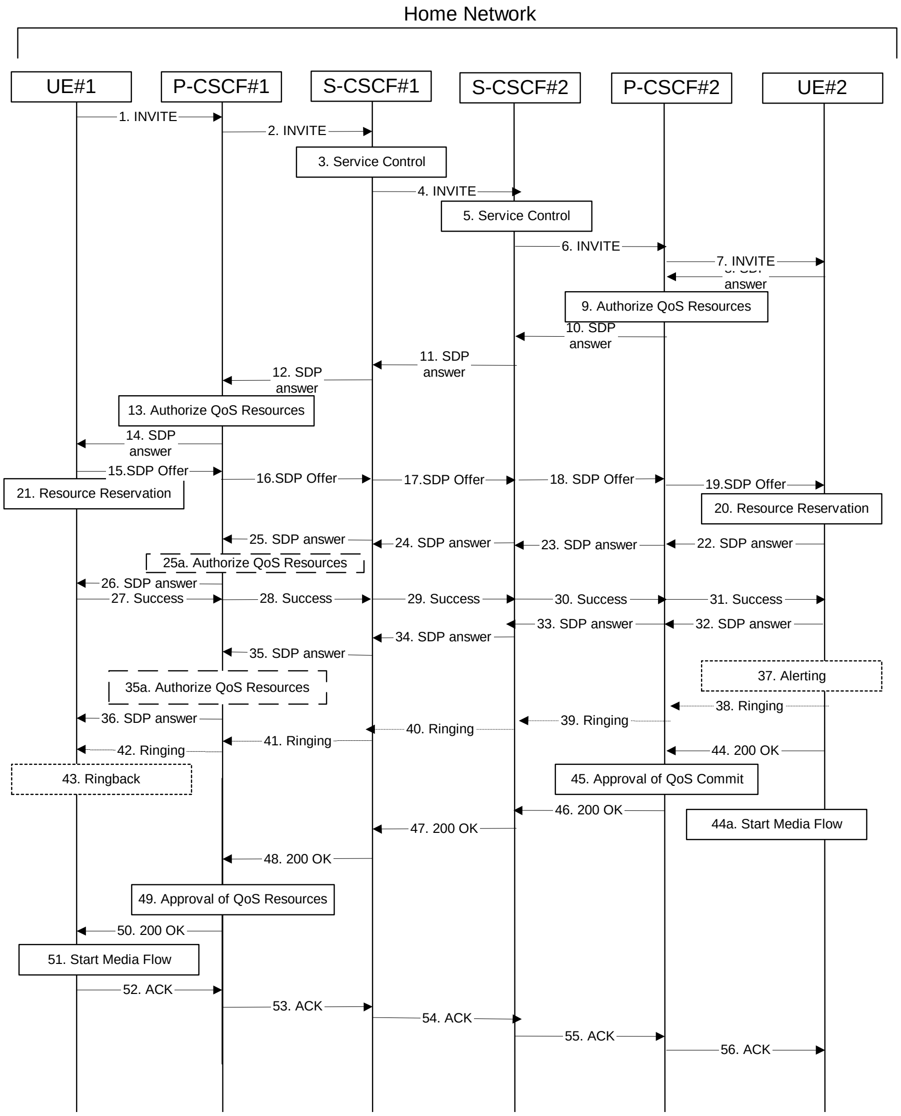


**Figure 5.33: Multimedia session flow - addition of another media**

Step-by-step processing of this end-to-end session flow is as follows:

1. UE#1 sends a SIP INVITE request, containing new SDP for the new media and including the original SDP, to P-CSCF#1, which was obtained from the CSCF discovery procedures.

2. P-CSCF#1 forwards the INVITE to the next hop name/address, as determined from the registration procedures. In this case the next hop is S-CSCF#1 within the same operator's network.

3. S-CSCF#1 validates the service profile, and performs whatever service control logic is appropriate for this session attempt.

4. S-CSCF#1 recognises that this invite applies to an existing session. It therefore forwards the INVITE along the existing path to S-CSCF#2.

5. S-CSCF#2 validates the service profile, and performs whatever service control logic is appropriate for this session attempt.

6. S-CSCF#2 remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to P-CSCF#2 in the home network.

7. P-CSCF#2 remembers (from the registration procedure) the address of UE#2 and forwards the INVITE to UE#2.

8. UE#2 returns the media stream capabilities of the destination to the session originator, along the signalling path established by the INVITE message.

9. P-CSCF#2 authorises the QoS resources required for this additional media.

10. P-CSCF#2 forwards the SDP to S-CSCF#2.

11. S-CSCF#2 forwards the SDP to S-CSCF#1.

12. S-CSCF#1 forwards the SDP message to P-CSCF#1.

13. P-CSCF#1 authorises the additional resources necessary for this new media.

14. P-CSCF#1 forwards the SDP message to the originating endpoint, UE#1.

15-19. The originator decides the offered set of media streams for this media addition, and sends the offered SDP to P-CSCF#1.

20. UE#2 initiates the resource reservation procedures for the resources necessary for this additional media.

21. After determining the offered set of media streams for this additional media, step #15 above, UE#1 initiates the reservation procedures for the additional resources needed for this new media.

22-25. When UE#2 has successfully reserved the needed resources, it sends the "reservation successful" message to UE#2 along the signaling path established by the INVITE message. The message is sent first to P-CSCF#1.

25a. P-CSCF#1 authorises any additional media for the proposed SDP.

26. P-CSCF#1 forwards the message to UE#1.

27-31. UE#1 sends the final agreed SDP to UE#2 via the established path.

32-35. UE#2 responds to the offered final media.

35a. P-CSCF#1 authorises the media agreed.

36. The response is forwarded to UE#1.

37.UE#2 may optionally delay the session establishment in order to alert the ~~subscriber~~ user to the incoming additional media.

38. If UE#2 performs alerting, it sends a ringing indication to the originator via the signalling path. The message is sent first to P-CSCF#2.

39. P-CSCF#2 forwards the ringing message to S-CSCF#2.

40. S-CSCF#2 performs whatever service control is appropriate for this ringing flow.

41. S-CSCF#2 forwards the message to S-CSCF#1.

32. 41. S-CSCF#1 forwards the message to P-CSCF#1.

42. P-CSCF#1 forwards the message to UE#1.

43. UE#1 indicates to the originator that the media addition is being delayed due to alerting. Typically this involves playing a ringback sequence.

44. When the destination party accepts the additional media, UE#2 sends a SIP 200-OK final response along the signalling path back to the originator. The message is sent first to P-CSCF#2.

44a. After sending the 200-OK, UE#2 may initiate the new media flow(s).

45. P-CSCF#2 approves the commitment of the QoS resources for this additional media.

. 46. P-CSCF#2 forwards the final response to S-CSCF#2.

47. S-CSCF#2 forwards the final response to S-CSCF#1.

48. S-CSCF#1 forwards the final response to P-CSCF#1.

9. P-CSCF#1 approves the commitment of the QoS resources for this additional media.

50. P-CSCF#1 forwards the final response to UE#1.

51. UE#1 starts the media flow(s) for this additional media.

52. UE#1 responds to the final response with a SIP ACK message, which is passed to the destination via the signalling path. The message is sent first to P-CSCF#1.

53. P-CSCF#1 forwards the ACK to S-CSCF#1

54. S-CSCF#1 forwards the ACK to S-CSCF#2.

55. S-CSCF#2 forwards the ACK to P-CSCF#2.

56. P-CSCF#2 forwards the ACK to UE#2.

next modified section

## 5.11.5 Session Redirection Procedures

This section gives information flows for the procedures for performing session redirection. The decision to redirect a session to a different destination may be made for different reasons by a number of different functional elements, and at different points in the establishment of the session.

Three cases of session redirection prior to bearer establishment are presented, and one case of session redirection after bearer establishment.

These cases enable the typical services of “Session Forward Unconditional”, “Session Forward Busy”, “Session Forward Variable”, “Selective Session Forwarding”, and “Session Forward No Answer”, though it is important to recognise that the implementation is significantly different from the counterparts in the CS domain.

### 5.11.5.1 Session Redirection initiated by S-CSCF to IMS

One of the functional elements in a basic session flow that may initiate a redirection is the S-CSCF of the destination ~~subscriber~~user. The ~~subscriber~~ user profile information obtained from the HSS by the ‘Cx-pull’ during registration may contain complex logic and triggers causing session redirection. S-CSCF#2 sends the SIP INVITE request to the I-CSCF for the new destination (I-CSCF#F in the diagram), who forwards it to S-CSCF#F, who forwards it to the new destination.

In cases when the destination ~~subscriber~~ user is not currently registered in the IM CN subsystem, the I-CSCF may assign a temporary S-CSCF to perform the service control on behalf of the intended destination. This temporary S-CSCF takes the role of S-CSCF#2 in the following information flow.

The service implemented by this information flow is typically “Session Forward Unconditional”, “Session Forward Variable” or “Selective Session Forwarding”. S-CSCF#2 may also make use of knowledge of current sessions in progress at the UE, and implement “Session Forwarding Busy” in this way.

This is shown in the following information flow:

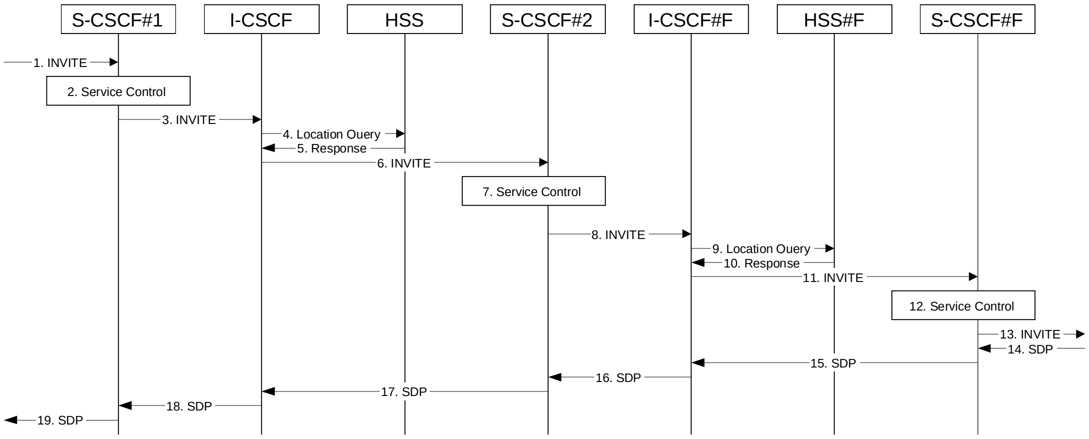


**Figure 5.36: Session redirection initiated by S-CSCF to IMS**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the destination subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator’s network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination ~~subscriber~~user.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating ~~subscriber~~user.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a new destination URL within the IP Multimedia Subsystem. Based on operator policy and the ~~subscriber~~ user profile, S-CSCF#2 may restrict the media streams allowed in the redirected session.
8. S-CSCF#2 sends a SIP INVITE request to an I-CSCF (I-CSCF#F) for the network operator to whom the forwarded destination subscribes. This INVITE request may optionally go through an I-CSCF(THIG) if S-CSCF#2 is in a different operator’s network than I-CSCF#F.
9. I-CSCF#F queries the HSS (HSS#F) for current location information of the destination ~~subscriber~~user.
10. HSS#F responds with the address of the current Serving CSCF (S-CSCF#F) for the terminating ~~subscriber~~user.
11. I-CSCF forwards the INVITE request to S-CSCF#F, who will handle the session termination.
12. S-CSCF#F performs whatever service control logic is appropriate for this session setup attempt
13. S-CSCF#F forwards the INVITE toward the destination UE, according to the procedures of the terminating flow.
14. The destination UE responds with the SDP message, and the session establishment proceeds normally.

### 5.11.5.2 Session Redirection to PSTN Termination (S-CSCF #2 forwards INVITE)

The S-CSCF of the destination user (S-CSCF#2) may determine that the session is to be redirected to a PSTN Termination; e.g. CS-domain endpoint, or to the PSTN. For session redirection to PSTN termination where the S-CSCF of the called party (S-CSCF#2) wishes to remain in the path of SIP signalling, the S-CSCF forwards the INVITE towards towards the destination according to the termination flow.

In cases when the destination ~~subscriber~~ user is not currently registered in the IM CN subsystem, the I-CSCF may assign a temporary S-CSCF to perform the service control on behalf of the intended destination. This temporary S-CSCF takes the role of S-CSCF#2 in the following information flow.

Handling of redirection to a PSTN Termination where the S-CSCF#2 forwards the INVITE is shown in the figure 5.37:

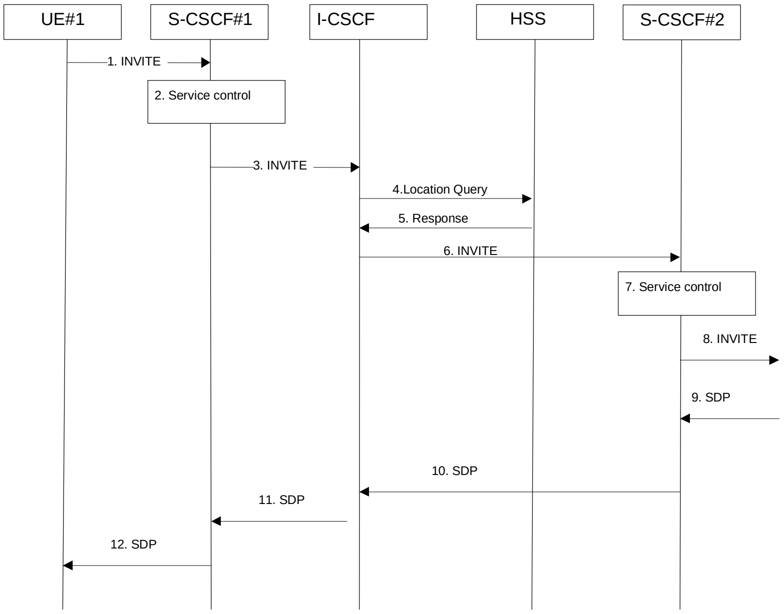


**Figure 5.37: Session redirection to PSTN Termination (S-CSCF #2 forwards INVITE)**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE #1 to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator's network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination ~~subscriber~~user.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating user~~subscriber~~.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a PSTN termination. . S-CSCF#2 determines that it wishes to remain in the path of the SIP signalling.
8. S-CSCF#2 forwards the INVITE toward the destination, according to the procedures of the terminating flow.
9. The destination responds with the SDP message, and the session establshment proceeds normally.

### 5.11.5.2a Session Redirection to PSTN Termination (REDIRECT to originating UE#1)

The S-CSCF of the destination user (S-CSCF#2) may determine that the session is to be redirected to a PSTN Termination; e.g. CS-domain endpoint, or to the PSTN. For session redirection to PSTN termination where the S-CSCF of the called party (S-CSCF#2) wishes to use the SIP REDIRECT method, the S-CSCF#2 will pass the new destination information (the PSTN Termination information) to the originator (UE#1). The originator (UE#1) can then initiate a new session to the redirected to destination denoted by S-CSCF#2.

Handling of redirection to a PSTN Termination where the S-CSCF#2 REDIRECTS to the originating UE#1 is shown in the figure 5.37a:

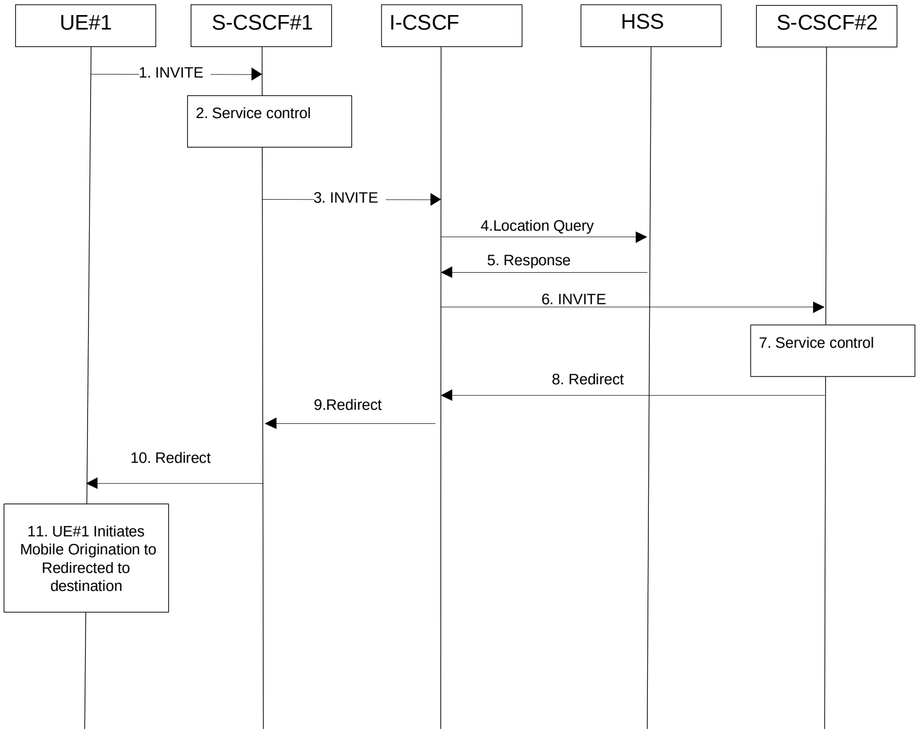


**Figure 5.37a: Session redirection to PSTN Termination (REDIRECT to originating UE#1)**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE#1 to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator's network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination ~~subscriber~~user.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating user~~subscriber~~.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a PSTN termination. S-CSCF#2 determines that it wishes to use the SIP REDIRECT method to pass the redirection destination information (the 'redirected-to PSTN Termination' information) to the originator (UE#1).
8. S-CSCF#2 sends a SIP Redirect response to I-CSCF with the redirection destination.

9. I-CSCF sends a Redirect response to S-CSCF#1, containing the redirection destination.

10. S-CSCF#2 forwards the Redirect response to UE#1, containing the redirection destination

UE#1 initiates a session to the ‘redirected-to PSTN Termination’ according to the mobile origination procedures supported in the UE (e.g. CS, IMS).

### 5.11.5.3 Session Redirection initiated by S-CSCF to general endpoint

The S-CSCF in the scenario above may determine that the session is to be redirected to an endpoint outside the IP MultiMedia System and outside the CS-domain. Examples of these destinations include web pages, email addresses, etc. It recognizes this situation by the redirected URL being other than a sip: or tel: URL.

Handling of redirection to a general URL is shown in the following information flow:

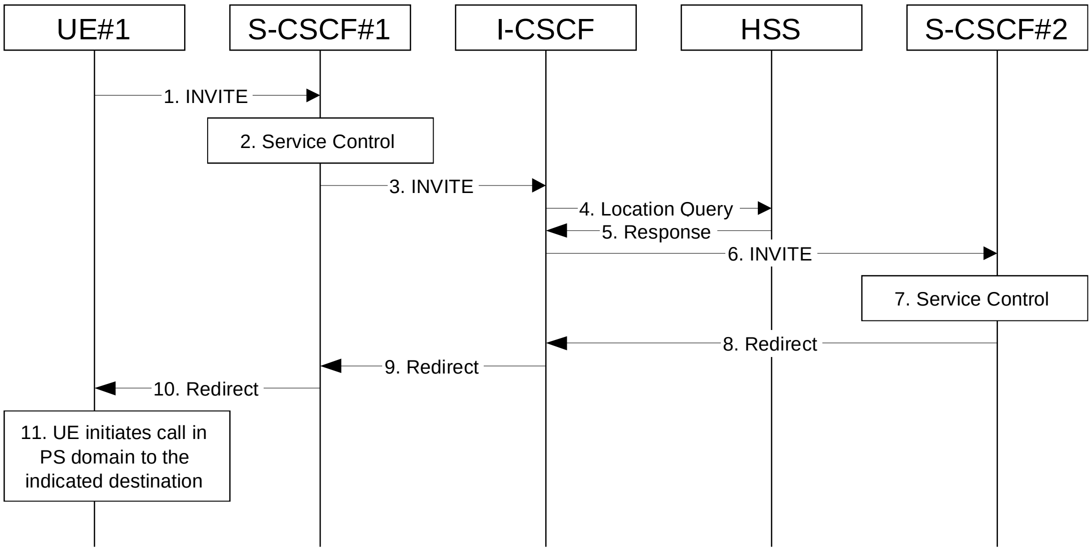


**Figure 5.38: Session redirection initiated by S-CSCF to general endpoint**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator’s network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination ~~subscriber~~user.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating user~~subscriber~~.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a new destination URL outside the IMS and outside the CS domain, i.e. other than a sip: or tel: URL.
8. S-CSCF#2 sends a SIP Redirect response back to I-CSCF, with redirection destination being the general URL.
9. I-CSCF sends a Redirect response back to S-CSCF#1, containing the redirection destination.
10. S-CSCF#1 forwards the Redirect response back to UE#1.
11. UE#1 initiates the session to the indicated destination.

### 5.11.5.4 Session Redirection initiated by P-CSCF

One of the functional elements in a basic session flow that may initiate a redirection is the P-CSCF of the destination ~~subscriber~~user. 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~~ user 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 sections 1, 2, or 3 above, based on the type of destination.

This is shown in the following information flow:

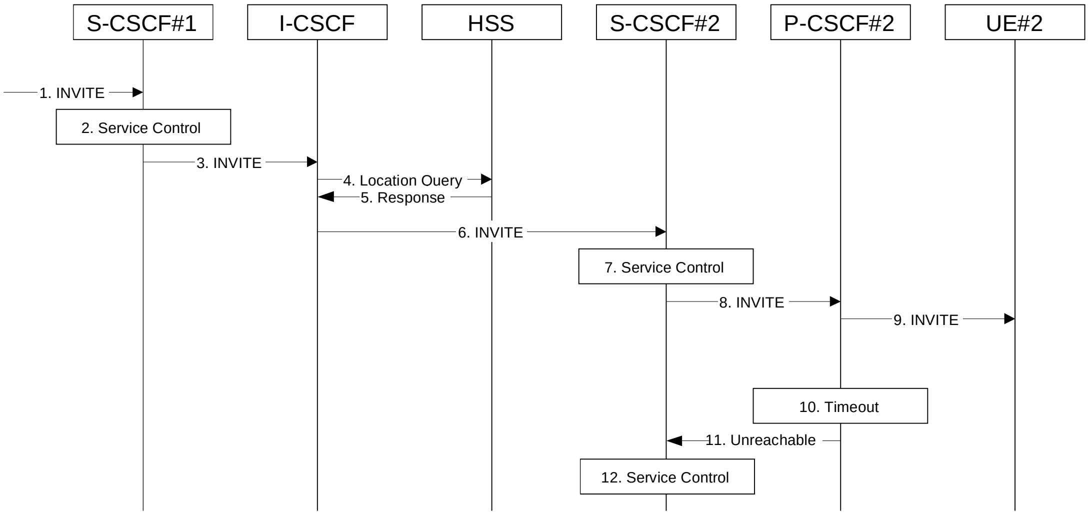


**Figure 5.39: Session redirection initiated by P-CSCF**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator's network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination user~~subscriber~~.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating user~~subscriber~~.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt.
8. S-CSCF#2 forwards the INVITE request to P-CSCF#2
9. P-CSCF#2 forwards the INVITE request to UE#2
10. Timeout expires in P-CSCF waiting for a response from UE#2. P-CSCF therefore assumes UE#2 is unreachable.
11. P-CSCF#2 generates an Unavailable response, without including a new destination, and sends the message to S-CSCF#2.
12. S-CSCF#2 performs whatever service control is appropriate for this session redirection. If the user does not subscribe to session redirection service, or did not supply a forwarding destination, S-CSCF#2 may terminate the session setup attempt with a failure response. Otherwise, S-CSCF#2 supplies a new destination URL, which may

be a phone number, an email address, a web page, or anything else that can be expressed as a URL. Processing continues according to subsections 1, 2, or 3 above, based on the type of destination URL.

### 5.11.5.5 Session Redirection initiated by UE

The next functional element in a basic session flow that may initiate a redirection is the UE of the destination ~~subscriber~~user. 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 information flow is typically “Session Forward Busy”, “Session Forward Variable” or “Selective Session Forwarding”.

This is shown in the following information flow:

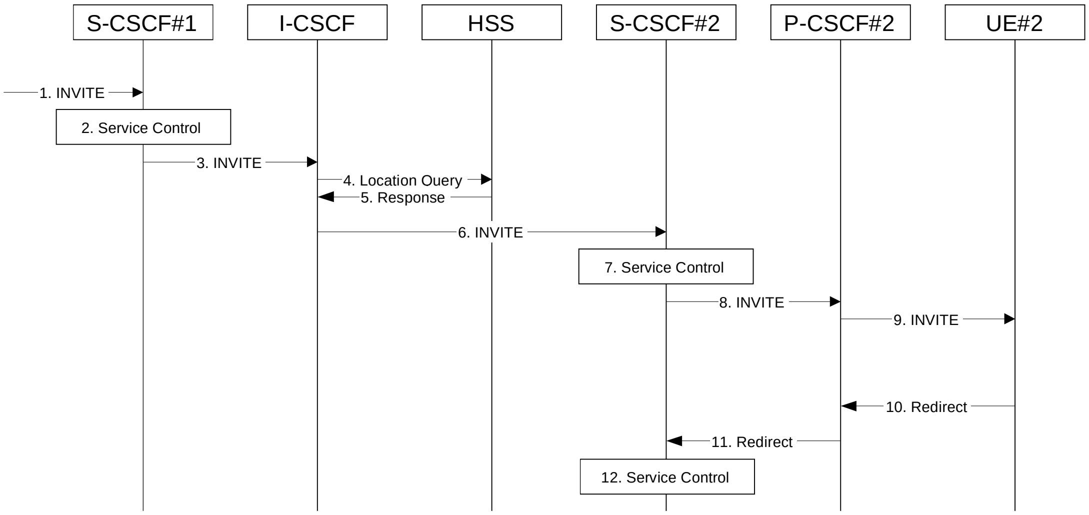


**Figure 5.40: Session redirection initiated by UE**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator’s network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination user~~subscriber~~.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating user~~subscriber~~.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt.
8. S-CSCF#2 forwards the INVITE request to P-CSCF#2
9. P-CSCF#2 forwards the INVITE request to UE#2
10. UE#2 determines that this session should be redirected, and optionally supplies the new destination URL. This new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. The Redirect response is sent to P-CSCF#2
11. P-CSCF#2 forwards the Redirect response to S-CSCF#2.

12. S-CSCF#2 performs whatever service control is appropriate for this session redirection. If UE#2 does not subscribe to session redirection service, or did not supply a new destination URL, S-CSCF#2 may supply one or may terminate the session setup attempt with a failure response. The new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. The procedures of subsection 1, 2, or 3 given above are followed, based on the type of URL.

#### 5.11.5.6 Session Redirection initiated after Bearer Establishment

The UE of the destination ~~subscriber~~ user may request the session be redirected after a customer-specified ringing interval. The UE may also implement customer-specific feature processing, and base its decision to redirect this session on such things as 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 signaling path to the originating endpoint, who initiates a session to the new destination.

The service implemented by this information flow is typically “Session Forward No Answer”.

Redirect to another IMS endpoint (e.g. a sip: URL) is shown in the following information flow:

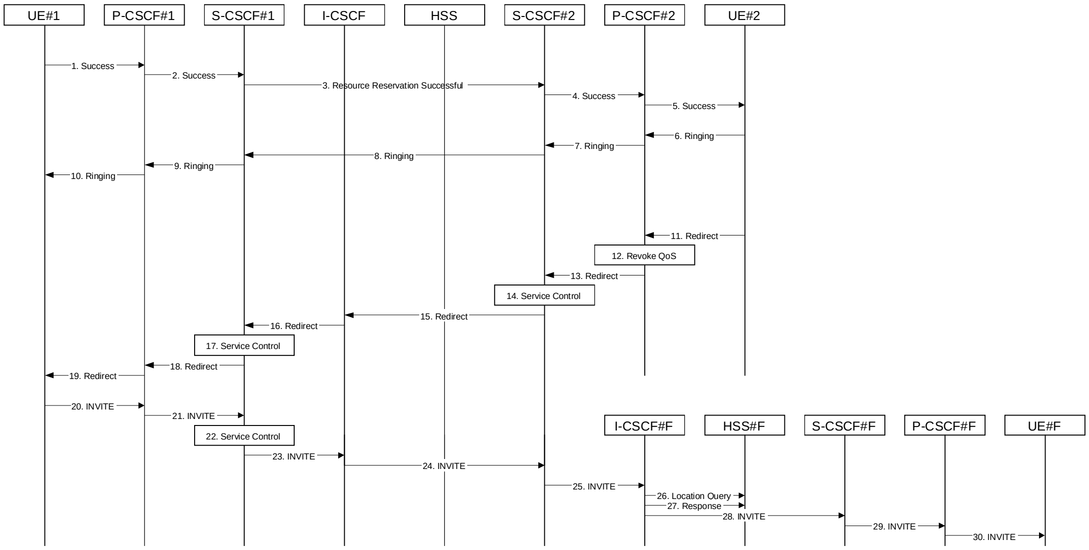


**Figure 5.41: Session redirection after bearer establishment**

Step-by-step processing is as follows:

1-10. Normal handling of a basic session establishment, up through establishment of the bearer channel and alerting of the destination ~~subscriber~~user

11. Based on a timeout or other indications, UE#2 decides the current session should be redirected to a new destination URL. This new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. The Redirect response is sent to P-CSCF#2.

12. P-CSCF#2 revokes any authorisation for QoS for the current session.

13. P-CSCF#2 forwards the Redirect response to S-CSCF#2.

14. S-CSCF#2 performs whatever service control is appropriate for this session redirection. If UE#2 does not subscribe to session redirection service, or did not supply a new destination URL, S-CSCF#2 may supply one or may terminate the session setup attempt with a failure response. The new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. S-CSCF#2 generates a private URL, addressed to itself, containing the new destination.

15. S-CSCF#2 sends a SIP Redirect response back to I-CSCF, containing the private URL addressed to S-CSCF#2.

16. I-CSCF sends a Redirect response back to S-CSCF#1, containing the redirection destination.

17. S-CSCF#1 checks the number of redirections that have occurred for this session setup attempt, and if excessive, aborts the session. S-CSCF#1 stores the new destination information, generates a private URL addressed to itself pointing to the stored information, and generates a modified Redirect response with the private URL.

18. S-CSCF#1 sends the modified Redirect response to P-CSCF#1

19. P-CSCF#1 sends the Redirect response to UE#1

20. UE#1 resets and releases all resources for the previous session, and initiates a new INVITE request to the address provided in the Redirect response. The new INVITE request is sent to P-CSCF#1

21. P-CSCF#1 forwards the INVITE request to S-CSCF#1

22. S-CSCF#1 retrieves the destination information saved in step #17, and performs whatever other service control is appropriate for this new session setup attempt.

23. S-CSCF#1 determines the network operator of the new destination address. The INVITE message is sent to I-CSCF#2, the I-CSCF for S-CSCF#2.

24. I-CSCF forwards the INVITE to S-CSCF#2

25. S-CSCF#2 decodes the private URL, determines the network operator of the new destination, and sends the INVITE request to the I-CSCF for that network operator.

26. The remainder of this session completes as normal.

next modified section

### 5.12.1 Mobile Terminating call procedures to unregistered Public User Identity that has services related to unregistered state

In Figure 5.43 below the Public User Identity is unregistered for IMS and the Public User Identity has services related to unregistered state. In this case, the HSS responds back to I-CSCF with an indication that I-CSCF should select S-CSCF for this MT call to the unregistered Public User Identity of the ~~subscriber~~ user or provide~~s~~ the I-CSCF with the previously allocated S-CSCF name. Before S-CSCF selection, I-CSCF shall query HSS for the information related to the required S-CSCF capabilities. I-CSCF selects a S-CSCF to perform service control and I-CSCF routes the call further to the selected destination. If the S-CSCF does not have the relevant information from the user~~subscriber~~ profile then the S-CSCF shall download the relevant information from HSS before it performs service control and any further actions in the call attempt. The service implemented by this information flow could be e.g. “Call Forward Unconditional.”

This is shown by the information flow in Figure 5.43:

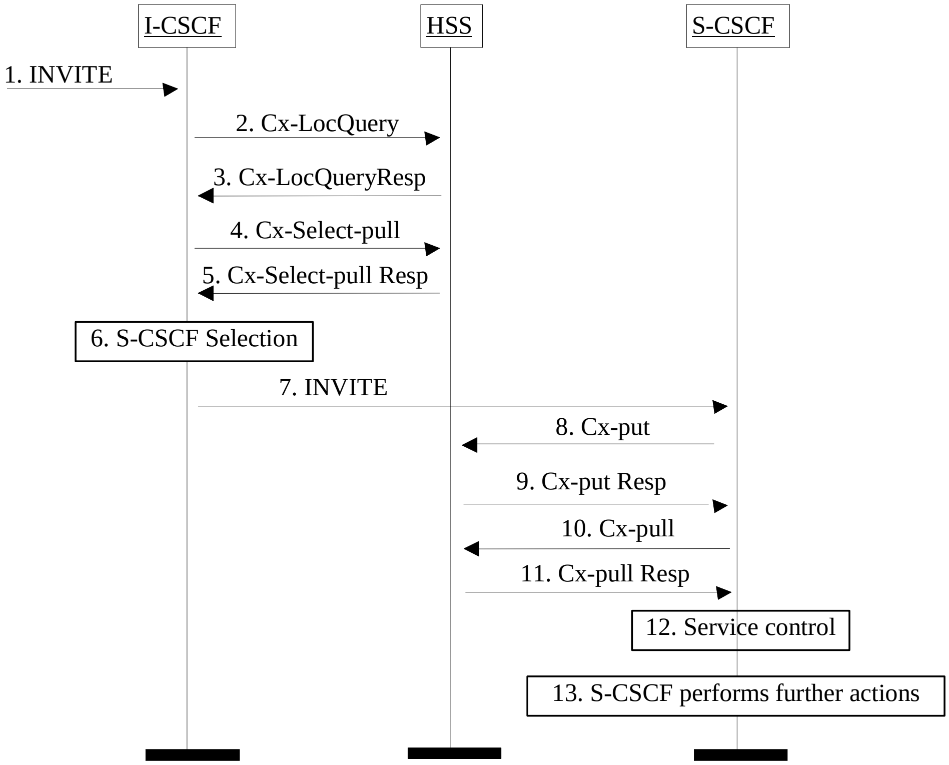


**Figure 5.43: Mobile Terminating call procedures to unregistered IMS Public User Identity that has services related to unregistered state**

1. I-CSCF receives an INVITE message.
2. I-CSCF queries the HSS for current location information.
3. HSS either responds with an indication that the Public User Identity is unregistered for IMS and I-CSCF should select a S-CSCF for the unregistered Public User Identity of the ~~subscriber~~ user or provides the I-CSCF with the previously allocated S-CSCF name for that user.
4. If the I-CSCF has not been provided with the location of the S-CSCF, the I-CSCF may send Cx-Select-Pull (unregistered, Public User Identity) to the HSS to request the information related to the required S-CSCF capabilities which shall be input into the S-CSCF selection function. This query is optional.
5. The HSS shall send Cx-Select-Pull Resp (required S-CSCF capabilities) to the I-CSCF.
6. If the I-CSCF has not been provided with the location of the S-CSCF, the I-CSCF selects an S-CSCF for the unregistered Public User Identity of the ~~subscriber~~user.
7. I-CSCF forwards the INVITE request to the S-CSCF.
8. The S-CSCF sends Cx-Put (Public User Identity, S-CSCF name) to the HSS. When multiple and separately addressable HSSs have been deployed by the network operator, then the S-CSCF needs to query the SLF to resolve the HSS. The HSS stores the S-CSCF name for unregistered Public User Identities of that ~~subscriber~~user. This will result in all terminating traffic for unregistered Public User Identities of that user~~subscriber~~ being routed to this particular S-CSCF until the registration period expires or the user~~subscriber~~ attaches the Public User Identity to the network. Note: Optionally the S-CSCF can omit the Cx-Put request if it has the relevant information from the ~~subscriber~~ user profile.
9. The HSS shall send Cx-Put Resp to the I-CSCF to acknowledge the sending of Cx-Put.
10. If the relevant information is not available, the S-CSCF shall send the Cx-Pull information flow (Public User Identity) towards the HSS in order to be able to download the relevant information of the service profile to the S-CSCF.

11. The HSS shall return the information flow Cx-Pull Resp (user information) to the S-CSCF. The S-CSCF shall store it for that indicated Public User Identity.

12. S-CSCF performs whatever service control is appropriate for this call attempt.

13.S-CSCF performs whatever further actions are appropriate for this call attempt (in the case where the S-CSCF decides to redirect the session towards CS domain, the Mobile Termination Procedure MT#3 (section 5.7.2a) applies).

The S-CSCF may deregister the Public User Identity at any time (e.g. according to operator network engineering requirements) by issuing a Cx-Put2 (Public User Identity, clear S-CSCF name) clearing the S-CSCF name stored in the HSS. If S-CSCF name stored by the HSS does not match the name of the S-CSCF that originated the Cx-Put2 then the HSS will acknowledge the clearing request but take no further action.

next modified section

### 5.12.2 Mobile Terminating call procedures to unregistered Public User Identitythat has no services related to unregistered state

In the example information flow the Public User Identity of the ~~subscriber~~ user is unregistered and the Public User Identityhas no services related to unregistered state.

This is shown in the following information flow (figure 5.44):

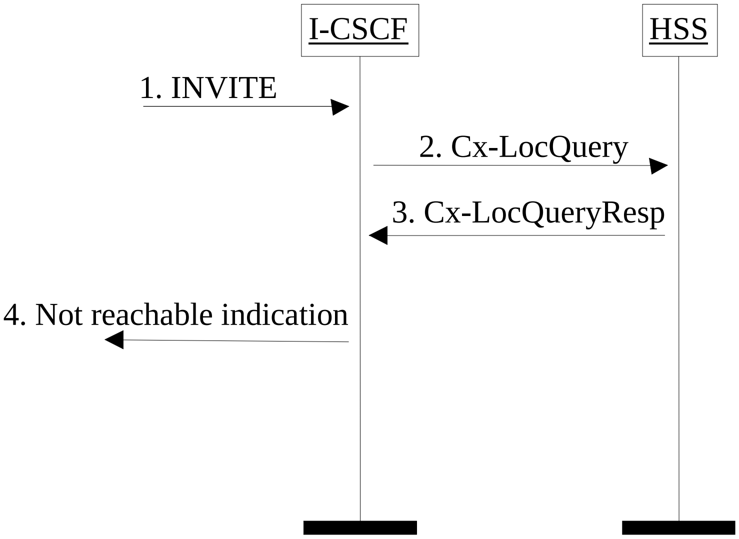


**Figure 5.44: Mobile Terminating call procedures to unregistered Public User Identity that has no services related to unregistered state**

1. I-CSCF receives an INVITE message.

2. I-CSCF queries the HSS for current location information.

3. HSS responds with an indication that the Public User Identity is unregistered, but no services are related to unregistered state.

I-CSCF responds to the origin of the request that the user is not reachable at the moment.

next modified section

## ~~5.15 Mobile Terminating session procedure for unknown subscriber~~5.15 Mobile Terminating session procedure for unknown user

This section describes information flows Mobile Terminating procedure for an unknown ~~subscriber~~user. The unknown ~~subscriber~~ user cases include those where session requests are made towards public user~~subscriber~~ identities that are incorrect, un-issued or have been cancelled/deleted. The determination of unknown ~~subscriber~~ user is carried out in the HSS and/or the SLF (for networks that require SLF functionality). The information flows of figures 5.45 and 5.46 illustrate how SIP messages can be used to inform the requesting party that the requested ~~subscriber~~ user is not known within the network.

### 5.15.1 Unknown ~~subscriber~~ user determined in the HSS.

In Figure 5.45 the unknown status of the requested party is determined in the HSS. The I-CSCF requests information on the ~~subscriber~~ user to be reached and the HSS responds back to the I-CSCF with an indication that the ~~subscriber~~user is unknown. The I-CSCF uses the indication that the ~~subscriber~~user is unknown returned from the HSS to formulate the correct SIP message back towards the originating party to inform them that the ~~subscriber~~user is unknown. The case where the SLF determines unknown status is in section 5.15.2. The flows of figure 5.45 could include SLF determination of the HSS, however these are not shown for clarity.

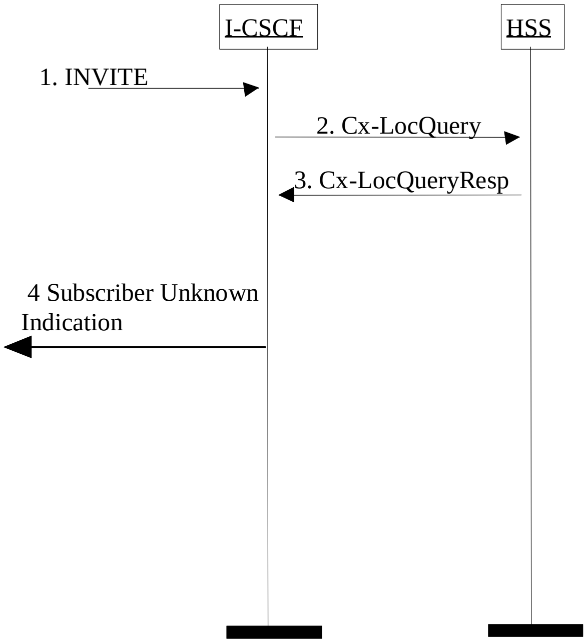


**Figure 5.45 HSS determination of unknown ~~subscriber~~user.**

1) I-CSCF receives an INVITE.

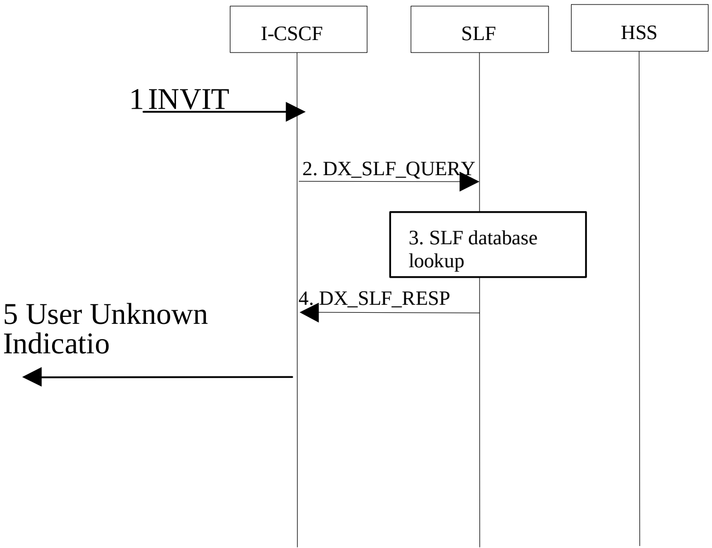
2) I-CSCF queries the HSS for current location information.

3) HSS responds with an indication that the ~~subscriber~~user is unknown

4) The I-CSCF responds to the origin of the request that the ~~subscriber~~user is unknown.

### 5.15.2 Unknown ~~subscriber~~user determined in the SLF

In Figure 5.46 the unknown status of the requested party is determined in the SLF. The I-CSCF requests information on the ~~subscriber~~user to be reached and the SLF responds back to the I-CSCF with an indication that the ~~subscriber~~user is unknown. The I-CSCF uses the indication that the ~~subscriber~~user is unknown returned from the SLF to formulate the correct SIP message back towards the originating party to inform them that the ~~subscriber~~user is unknown.



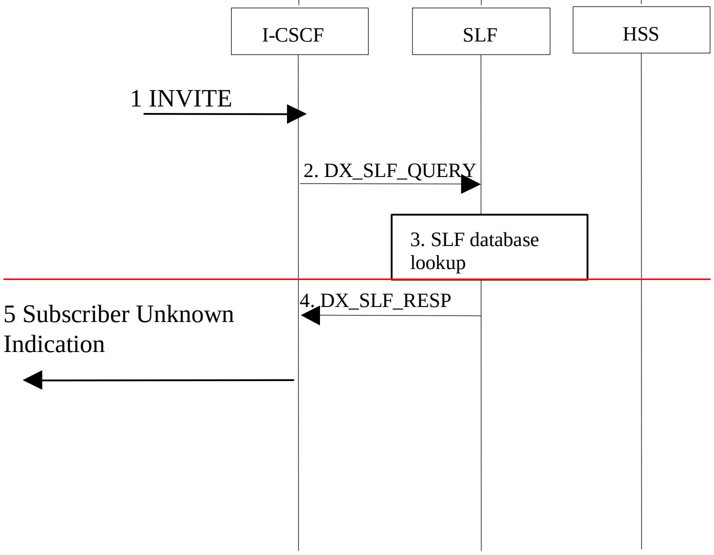


**Figure 5.46 SLF determination of unknown ~~subscriber~~user.**

1) The ICSCF receives an INVITE request and now has to query for the location of the ~~subscriber's~~ user's subscription data.

2) The I-CSCF sends a DX_SLF_QUERY to the SLF and includes as parameter the ~~subscriber~~user identity which is stated in the INVITE request.

3) The SLF looks up its database for the queried ~~subscriber~~user identity.

4) The SLF answers with an indication that the ~~subscriber~~user is unknown.

5) The I-CSCF responds to the origin of the request that the ~~subscriber~~user is unknown.

next modified section

# Annex A (Informative): Information flow template

This section describes the template used in developing information flow (IF) procedures.

X.Y.Z "Name of procedure (e.g., Terminal location registration)"

In this section, provide a brief prose description of the service or network capability. The "X.Y.Z." refers to the section heading number.

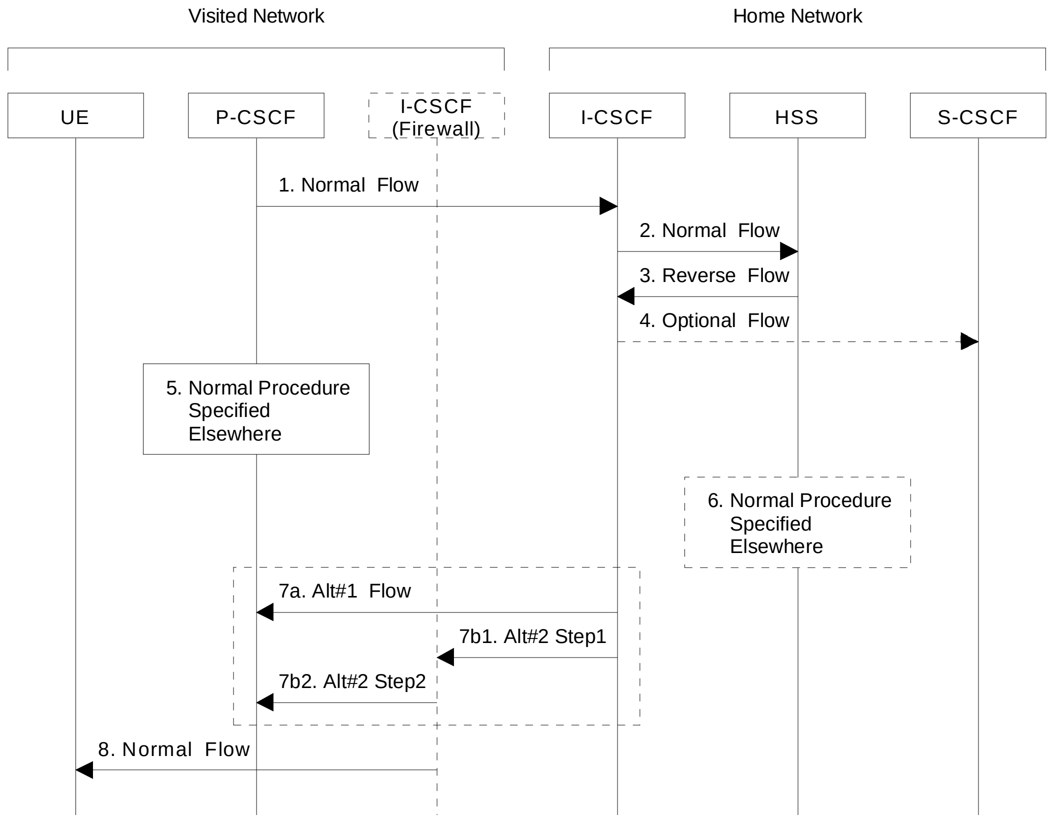


**Figure A.1: Information Flow Template**

This sub-section consists of subparagraphs each dedicated to one information flow of the IF diagram. For each information flow, a detailed description is provided on the information flow name, certain information elements (IEs) within the information flow, whether the IE is mandatory or optional (M/O), in the sequence as shown in the IF diagram. FE actions (FEA) are also provided in this section. This sub-section format is proposed as follows:

1. Initial information flow: One should normally describe the initiating FE Action (FEA) leading to the first flow. Any information that is specifically required to support the operation should be mentioned (e.g. this flow conveys the ~~subscriber~~user identity to the HSS).

2. Each paragraph should contain a brief description of the flow and any specific start and end FEAs. When information to be conveyed is optional, the conditions for its inclusion should be specified and the response to its presence when received should also be specified (e.g., Include IP Address when condition xyz occurs). For an information flow that is required, the description should indicate whether a response is required based on successful outcome to the received IF, failed outcome, both or neither. e.g., "Response is required indicating Success or Failure".

3. Flows may occur in either direction but not both at the same time. To indicate a shorthand for multiple flows, use a procedure box as in flow 5 or 6.

4. Flows that are an optional part of the procedure should be shown as dotted arrows as in flow 4. These may appear in either direction.

5. A set of flows, representing a common procedure, is shown by a box. The procedure should be numbered and named with a name that corresponds to the procedure as described elsewhere. The location of the box on an entity represents the start of the common procedure regardless of the number of the entities involved in the procedure.

6. An optional set of flows is represented as a dashed box. Otherwise the use is the same as in flow 5.

7. A small number of alternative flows may be shown within a dashed box. The alternatives are shown by a letter immediately following the flow number, e.g. 7a, 7b, 7c, etc. Where a single alternative results in multiple flows, they must be shown with an indication of the proper sequence, e.g. 7b1, 7b2. The subparagraph describing the information flow must describe the decision process taken in choice of alternatives.

   7a. Alternative (a) is described. If alternative (a) is a single information flow, the contents and purpose of that information flow is included here.

   7b. Alternative (b) is described.

      7b1. The first information flow of alternative (b) is described

      7b2. The second information flow of alternative (b) is described. Etc.

8. The final flow in a procedure may provide additional information regarding other procedures that might follow it but such information is not required.

The general characteristics of the information flow template are as follows:

- All relevant functional entities are contained in the flow diagram. Only relevant entities need be shown.

- When an element occurs only in an information flows for which several alternatives exist, the description box for the functional entity and the vertical line shall be dashed lines.

- The specific network affiliation of functional entities may be shown using a labelled bracket over the specific entities as shown in the figure (e.g., Home Network). Such labelling is not required unless the flow would not be clear without it.

- The number associated with each flow provides a “handle” to the functional entity action (FEA) executed by the FE receiving the flow. This number is known only within the scope of the specific information flow diagram. The description of this functional entity action (FEA) immediately follows the information flow description.

- Common Procedures described elsewhere can be used in the information flows in order to simplify the diagram. These may be either required or optional.

- Each common procedure is treated as a single action and therefore is given a unique number.

- An optional flows (flows 4 and 6) are indicated by a dashed arrow or box.

- Co-ordinated flows or flows that illustrate parallel actions are indicated by the flow text description. For example one might see a description such as: "flows 5 and 6 may be initiated any time after flow 3".

- Sequential operation is assumed unless indicated otherwise.

End of changes

**3GPP TSG-SA2 Meeting #25**
**Finland, 24 – 28th June, 2002**

***Tdoc S2-021954***

### 5.2.2.3 Registration information flow – User not registered

The application level registration can be initiated after the registration to the access is performed, and after IP connectivity for the signalling has been gained from the access network. For the purpose of the registration information flows, the subscriber is considered to be always roaming. For subscribers roaming in their home network, the home network shall perform the role of the visited network elements and the home network elements.

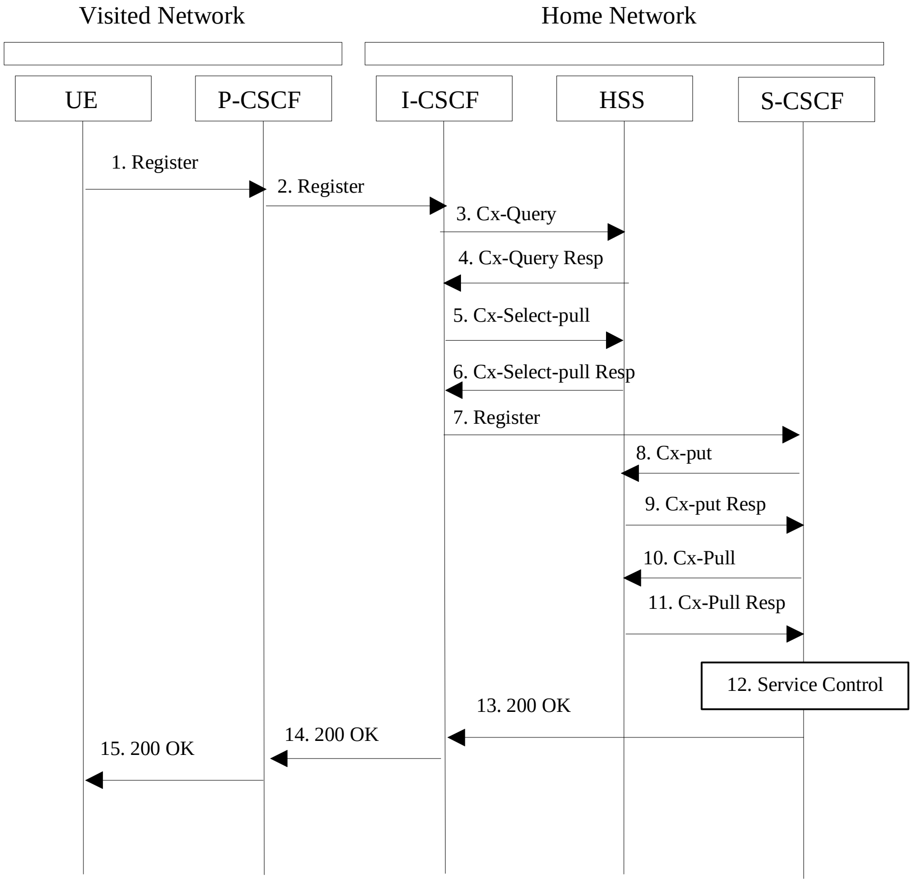


**Figure 5.1: Registration – User not registered**

1. After the UE has obtained a signalling channel through the access network, it can perform the IM registration. To do so, the UE sends the Register information flow to the proxy (public user identity, private user identity, home network domain name, UE IP address).

2. Upon receipt of the register information flow, the P-CSCF shall examine the “home domain name” to discover the entry point to the home network (i.e. the I-CSCF). The proxy shall send the Register information flow to the I-CSCF (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address). A name-address resolution mechanism is utilised in order to determine the address of the home network from the home domain name. The P-CSCF network identifier is a string that identifies at the home network, the network where the P-CSCF is located (e.g., the P-CSCF network identifier may be the domain name of the P-CSCF network).

3. The I-CSCF shall send the Cx-Query information flow to the HSS (public user identity, private user identity, P-CSCF network identifier).

The HSS shall check whether the user is registered already. The HSS shall indicate whether the user is allowed to register in that P-CSCF network (identified by the P-CSCF network identifier) according to the User subscription and operator limitations/restrictions if any.

4. Cx-Query Resp is sent from the HSS to the I-CSCF. ~~it~~ It shall contain the S-CSCF name, if it is known by the HSS. If the checking in HSS was not successful the Cx-Query Resp shall reject the registration attempt.

5. If the I-CSCF has not been provided with the name of the S-CSCF then the I-CSCF shall send Cx-Select-Pull (public user identity, private user identity) to the HSS to request the information related to the required S-CSCF capabilities which shall be input into the S-CSCF selection function.

6. On receipt of the Cx-Select-Pull, ~~T~~the HSS shall send Cx-Select-Pull Resp (required S-CSCF capabilities) to the I-CSCF.

7. The I-CSCF, using the name of the S-CSCF, shall determine the address of the S-CSCF through a name-address resolution mechanism. The I-CSCF also determines the name of a suitable home network contact point, possibly based on information received from the HSS. The home network contact point may either be the S-CSCF itself, or a suitable I-CSCF(THIG) in case network configuration hiding is desired. If an I-CSCF(THIG) is chosen as the home network contact point for implementing network configuration hiding, it may be distinct from the I-CSCF that appears in this registration flow, and it shall be capable of deriving the S-CSCF name from the home contact information. I-CSCF shall then send the register information flow (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address, I-CSCF(THIG) in case network configuration hiding is desired) to the selected S-CSCF. The home network contact point will be used by the P-CSCF to forward session initiation signalling to the home network.

8. The S-CSCF shall send Cx-Put (public user identity, private user identity, S-CSCF name) to the HSS. The HSS stores the S-CSCF name for that subscriber.

9. The HSS shall send Cx-Put Resp to the S~~I~~-CSCF to acknowledge the sending of Cx-Put.

10. On receipt of the Cx-Put Resp information flow, the S-CSCF shall send the Cx-Pull information flow (public user~~-~~ identity, private user identity) to the HSS in order to be able to download the relevant information from the subscriber profile to the S-CSCF. The S-CSCF shall store the P-CSCF address/name, as supplied by the visited network. This represents the address/name that the home network forwards the subsequent terminating session signalling to for the UE.

11. The HSS shall return the information flow Cx-Pull Resp (user information) to the S-CSCF. The user information passed from the HSS to the S-CSCF shall include one or more names/addresses information which can be used to access the platform(s) used for service control while the user is registered at this S-CSCF. The S-CSCF shall store the information for the indicated user. In addition to the names/addresses information, security information may also be sent for use within the S-CSCF.

12. Based on the filter criteria, the S-CSCF shall send register information to the service control platform and perform whatever service control procedures are appropriate.

13. The S-CSCF shall return the 200 OK information flow (home network contact information) to the I-CSCF. If an I-CSCF is chosen as the home network contact point for implementing network configuration hiding, the I-CSCF shall encrypt the S-CSCF address in the home network contact information.

14. The I-CSCF shall send information flow 200 OK (home network contact information) to the P-CSCF. The I-CSCF shall release all registration information after sending information flow 200 OK.

15. The P-CSCF shall store the home network contact information, and shall send information flow 200 OK to the UE.

Note: The encryption mechanism for implementing network configuration hiding is specified in TS 33.203.

**3GPP TSG–SA2 Meeting #25**
**Naantali, Finland, 24th to 28th June 2002**

***Tdoc* ⌘S2-021899**

*CR-Form-v7*

# CHANGE REQUEST

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **180** | ⌘**rev** | **1** | ⌘ | Current version: **5.5.0** | ⌘ |

*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:*** | ⌘ | Procedures for providing or blocking identity | | |
| ***Source:*** | ⌘ | Orange France, Nortel Networks | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 17/06/2002 |
| ***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:*** ⌘ The current Caller-ID procedures available in section 5.11.4 of TS 23.228 use very ambiguous terminology which is not consistent with the rest of the specification. This CR proposes to clarify and to align the terminology.

Furthermore, the S-CSCF is in charge of verifying the "user name' given by the UE wich is useless andrequires storage capacity in the S-CSCF. Besides whenever the user will decide to change its 'user name' an update should be done in the network…

As part of procedure for blocking identity, when privacy is required, the IP address of UE shall be blocked too, otherwise the identity could be retrieved using route tracers for example.

Moreover for emergency calls, the S-CSCF shall support the ability to override the privacy even if the originating identity is blocked.

***Summary of change:*** ⌘ This document proposes to :
- Align the terminology, change user name with display name
- Modify the Caller-ID procedures :
    - Delete the user name verification in the S-CSCF#1.
    - Add an override capability in S-CSCF#2.
- Consider as part of the identity : the public user identity(ies) and the display name.

Other changes are editorial.

| | | |
|---|---|---|
| ***Consequences if not approved:*** | ⌘ | - Unnecessary data stored in the S-CSCF (user name)<br>- Unnecessary authentication on user name<br>- No override capability (misalignement with stage 1 specifications) |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.11.4 | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | | **X** | Other core specifications | ⌘ | |
| | | | **X** | Test specifications | | |
| | | | **X** | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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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 containin

### 5.11.4 ~~Caller-ID procedures~~Procedures for providing or blocking identity

Identity is composed of a public user identity and an optional display name:

- The public user identity is used by any user for requesting communications to other users (see section 4.3.3.2).
- The display name is the user's name if available, an indication of privacy or unavailability otherwise. The display name is a text string which may identify the subscriber, the user or the terminal.

This section gives information flows for the procedures for providing ~~authenticated Caller-ID and Calling-Name information to the destination subscriber.~~the authenticated public user identity and the optional display Name information of the originating party to theterminating party. It also describes the mechanisms for blocking the display of ~~Caller-ID~~public user identity and optional display name if requested by the ~~originator.~~originating party.

#### 5.11.4.1 Procedures for providing the authenticated ~~caller-ID~~identity of the originating party

Authentication of the subscriber is performed during the registration procedures, as described in section 5.2.2.3. As a result of the registration procedures, ~~the URL of UE#1 is stored in P-CSCF#1, and the list of possible user names associated with UE#1 is stored in S-CSCF#1.~~one or several public user identity(ies) of the originating party is/are stored in P-CSCF#1. This is shown in the sub-procedure represented in the following information flow in step 1.

When UE#1 attempts to initiate a new session, it includes ~~this URL~~a public user identity in the INVITE request. P-CSCF#1 verifies that it is present and correct before passing the request to S-CSCF#1. ~~The S-CSCF#1 then verifies the user-name supplied by UE#1 against the list of possible user-names configured for the subscriber. Thus the INVITE request sent between S-CSCFs will always have authenticatedcaller-identification information.~~

~~If the URL~~In the following call flow, it is assumed that no privacy has been required by UE#1.If thepublic user identity supplied by UE#1 in the INVITE request is incorrect, the P-CSCF may reject the request, or may overwrite with the correct URL.

~~If the user-name supplied by UE#1 in the INVITE request is incorrect, the S-CSCF may reject the request, or may overwrite with a default user-name for the subscriber.~~

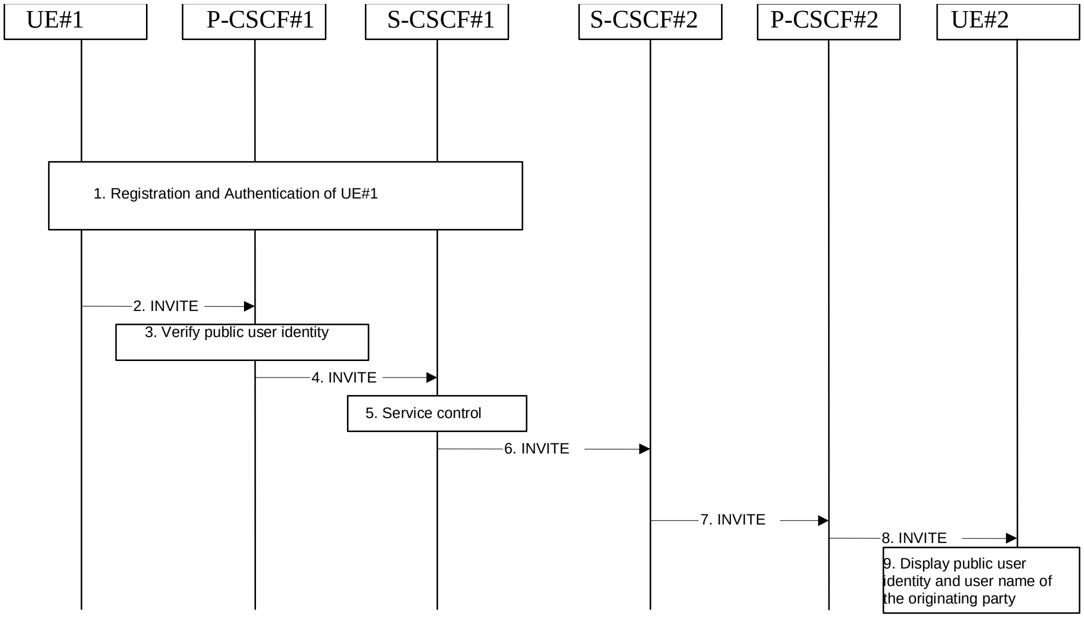

UE#1
P-CSCF#1
S-CSCF#1
S-CSCF#2
P-CSCF#2
UE#2
1. Registration and Authentication of UE#1
2. INVITE
3. Verify public user identity
4. INVITE
5. Service control
6. INVITE
7. INVITE
8. INVITE
9. Display public user identity and user name of the originating party

**Figure 5.34: Providing  the authenticated ~~caller-ID~~Identity of the originating party**

The detailed procedure is as follows:

1. Registration and authentication of UE#1 is performed.

2. UE#1 initiates a new multi-media session, by sending an INVITE request to P-CSCF#1. This INVITE request includes ~~the subscriber-identity URL used in the registration, and a caller-name string~~a public user identity, and may include a display name that may identify the specific person using the UE.

3. P-CSCF#1 checks the ~~subscriber's identifying URL,~~public user identity of the originating party, and replaces it (or rejects the request) if it is incorrect.

4. P-CSCF#1 forwards the INVITE request, with the verified ~~subscriber~~public user identity ~~URL~~, to S-CSCF#1.

5. S-CSCF#1~~verifies the caller-name string provided by UE#1 is included in the set of valid caller-names for this subscriber. It replaces it (or rejects the request) if it is incorrect.~~

performs whatever service control logic is appropriate for this session set up attempt to check in particular that no identity restriction is active6. S-CSCF#1 forwards the INVITE request, with verified ~~subscriber identity URL and caller-name,~~public user identity and display name of the originting party if present, to S-CSCF#2.

~~7. S-CSCF#2 stores the originating subscriber identity, for possible use later in session-trace or return-session services.~~

8. S-CSCF#2 forwards the INVITE request to P-CSCF#2.

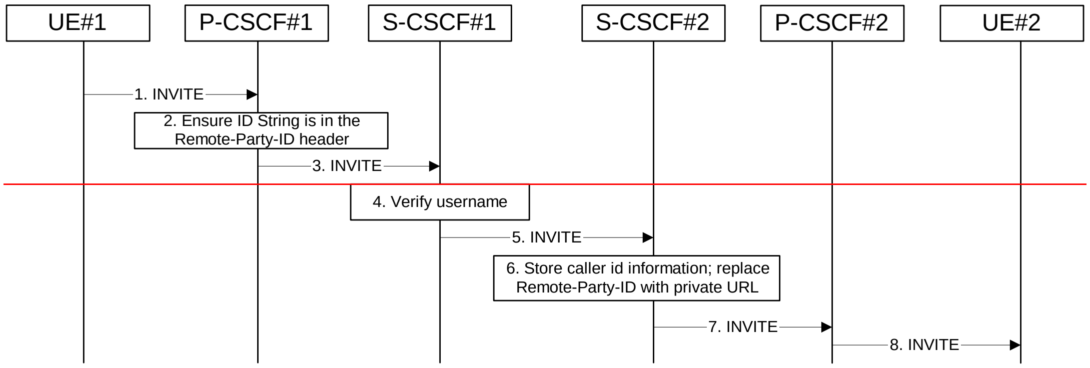
9. P-CSCF#2 forwards the INVITE request to UE#2.

10. UE#2 displays the ~~caller-id and calling-name~~public user identity and the display name information ~~to the destination~~(i.e. user-name if available, indication of privacy or unavailability otherwise) to the terminating party.

### 5.11.4.2 Procedures for ~~caller-ID blocking~~blocking the identity of the originating party

Regulatory agencies, as well as subscribers, may require the ability of an ~~originator~~originating party to block the display of their ~~caller identification.~~identity either permanently or on a session by session basis. This is a function performed by the destination ~~S-CSCF.~~P-CSCF. In this way, the ~~destination subscriber~~terminating party is still able to do a session-return, session-trace, transfer, or any other supplementary service.

~~The identity of the originator is stored at S-CSCF#2, and S-CSCF#2 generates a private URL that can be passed to UE#2 without compromising the identity of the session originator.~~


UE#1
P-CSCF#1
S-CSCF#1
S-CSCF#2
P-CSCF#2
UE#2
1. INVITE
2. Ensure ID String is in the Remote-Party-ID header
3. INVITE
4. Verify username
5. INVITE
6. Store caller id information; replace Remote-Party-ID with private URL
7. INVITE
8. INVITE

~~Figure 5.35: Caller-ID blocking~~

In this call flow, it is assumed that privacy has been required by UE#1 on public user identity (i.e. 'id' privacy) .

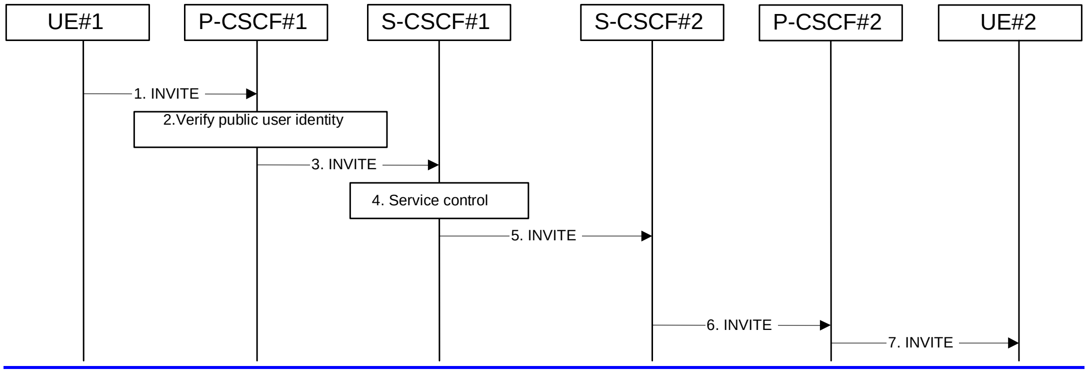


**Figure 5.35: ~~Caller ID~~ blocking the identity of the originating party**

The detailed procedure is as follows:

1. UE#1 initiates a new multi-media session, by sending an INVITE request to P-CSCF#1. This INVITE request includes ~~ the subscriber-identity URL used in the registration, and a caller-name string~~a public user identity , and may include a display name that may identify the specific person using the UE. Also included in this INVITE message is ~~a request that the caller-identity~~an indication that the identity of the originating party shall not be revealed to the destination.

2. P-CSCF#1 checks the ~~subscriber's identifying URL,~~public user identity of the originating party, and replaces it (or rejects the request) if it is incorrect.

3. P-CSCF#1 forwards the INVITE request, with the verified ~~subscriber~~public user identity ~~URL~~, to S-CSCF#1.

4. S-CSCF#1 ~~verifies the caller-name string provided by UE#1 is included in the set of valid caller-names for this subscriber. It replaces it (or rejects the request) if it is incorrect.~~performs whatever service control logic is appropriate for this session set up attempt.  Based on the subscriber's profile, S-CSCF#1 may insert ~~a request~~an indication in the INVITE message that the ~~caller-identity~~identity of the originating party  shall not be revealed to ~~the destination.~~

theterminating party. S-CSCF#1 may insert an indication to block the IP address of  UE#1 too and may remove other information from the messaging which may identify the caller to the terminating party.

5. S-CSCF#1 forwards the INVITE request, with verified ~~subscriber identity URL and caller-name,~~public user identity , and with user-name of the originating party if present, to S-CSCF#2.

6. ~~S-CSCF#2 stores the originating subscriber identity, for possible use later in session-trace or return-session services. If caller-id blocking is requested, it replaces the caller-id with a private URL pointing to the stored information. If caller-name blocking is requested, it deletes the calling-name from the INVITE message.~~

~~7.  S-CSCF#2 forwards the INVITE request to P-CSCF#2.~~If the terminating party has an override functionality in S-CSCF#2/Application Server in the terminating network removes the indication of privacy from the message.

7.  S-CSCF#2 forwards the INVITE request to P-CSCF#2.

8.  ~~8. P-CSCF#2 forwards~~If privacy of the user identity is required, P-CSCF#2 removes the public user identity from the message before forwarding the INVITE request to UE#2.

**3GPP TSG–SA2 Meeting #25**
**Naantali, Finland, 24th to 28th June 2002**

***Tdoc* ⌘S2-021898**

*CR-Form-v7*

# CHANGE REQUEST

⌘ **23.228 CR 181** ⌘**rev 1** ⌘ Current version: **5.5.0** ⌘

*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:*** | ⌘ | Corrections on session redirection procedures | | | |
| ***Source:*** | ⌘ | Orange France | | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** | ⌘ | 17/06/2002 |
| ***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:*** ⌘

- The "Session Redirection to general endpoint (REDIRECT to origination UE#1)" procedure should be considered as a "service related to unregistered state". Otherwise, the call will be rejected if the destination UE is not registered.
- In the "session redirection after bearer establishment" procedure, the resources should be released for the originating party. Otherwise, if UE#1 does not initiate a new session with the new destination, the PDP context(s) will still be active.

***Summary of change:*** ⌘

- A paragraph is added in the "Session Redirection to general endpoint (REDIRECT to origination UE#1)" procedure to take into account the case when the user is not registered in the IMS but has subsctibed to 'services related to unregistered state'.
- In "session redirection after bearer establishment", P-CSCF#1 revokes the QoS authorized for the originating party.
- The destination S-CSCF forwards the INVITE using the S-S#3 or S-S#4 procedure in the "Session redirection to PSTN Termination (S-CSCF#2 forwards INVITE).

***Consequences if not approved:*** ⌘ Services related to session redirection will not be complete.

***Clauses affected:*** ⌘ 5.11.5 Session redirection procedures

| **Y** | **N** |
|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Other specs affected:*** | ⌘ | | **X** | Other core specifications | ⌘ | |
| | | | **X** | Test specifications | | |
| | | | **X** | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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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 containin

## 5.11.5 Session Redirection Procedures

This section gives information flows for the procedures for performing session redirection. The decision to redirect a session to a different destination may be made for different reasons by a number of different functional elements, and at different points in the establishment of the session.

Three cases of session redirection prior to bearer establishment are presented, and one case of session redirection after bearer establishment.

These cases enable the typical services of “Session Forward Unconditional”, “Session Forward Busy”, “Session Forward Variable”, “Selective Session Forwarding”, and “Session Forward No Answer”, though it is important to recognise that the implementation is significantly different from the counterparts in the CS domain.

********************************SKIPPED TEXT************************************

### 5.11.5.2 Session Redirection to PSTN Termination (S-CSCF #2 forwards INVITE)

The S-CSCF of the destination user (S-CSCF#2) may determine that the session is to be redirected to a PSTN Termination; e.g. CS-domain endpoint, or to the PSTN. For session redirection to PSTN termination where the S-CSCF of the called party (S-CSCF#2) wishes to remain in the path of SIP signalling, the S-CSCF forwards the INVITE to a BGCF. Then the BGCF (in the local network or in another network) will forward the INVITE to a MGCF, which will forward ~~towards~~ towards the destination according to the termination flow.

In cases when the destination subscriber is not currently registered in the IM CN subsystem, the I-CSCF may assign a temporary S-CSCF to perform the service control on behalf of the intended destination. This temporary S-CSCF takes the role of S-CSCF#2 in the following information flow.

Handling of redirection to a PSTN Termination where the S-CSCF#2 forwards the INVITE is shown in the figure 5.37:

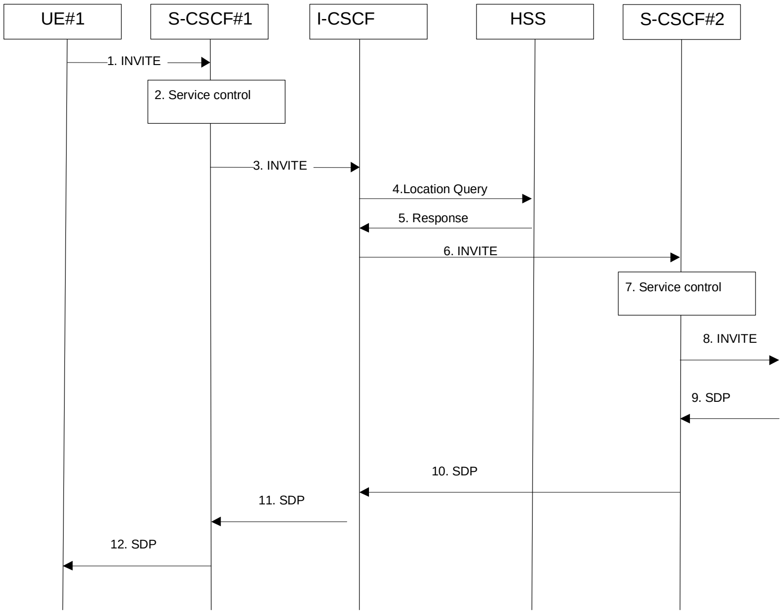

**Figure 5.37: Session redirection to PSTN Termination (S-CSCF #2 forwards INVITE)**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE #1 to S-CSCF#1 by the procedures of the originating flow.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.

3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator's network than I-CSCF.

4. I-CSCF queries the HSS for current location information of the destination subscriber.

5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating subscriber.

6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.

7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a PSTN termination. . S-CSCF#2 determines that it wishes to remain in the path of the SIP signalling.

~~8.~~ S-CSCF#2 forwards the INVITE ~~toward the destination, according to~~ using the Serving to Serving procedures S-S#3 or S-S#4~~of the terminating flow~~. The PSTN terminating flows are then followed.

9. The destination responds with the SDP message, and the session establshment proceeds normally.

**********************************NEXT CHANGE*********************************************

### 5.11.5.3 Session Redirection initiated by S-CSCF to general endpoint (REDIRECT to originating UE#1)

The S-CSCF in the scenario above may determine that the session is to be redirected to an endpoint outside the IP MultiMedia System and outside the CS-domain. Examples of these destinations include web pages, email addresses, etc. It recognizes this situation by the redirected URL being other than a sip: or tel: URL.

In cases when the destination subscriber is not currently registered in the IM CN subsystem, the I-CSCF may assign a temporary S-CSCF to perform the service control on behalf of the intended destination. This temporary S-CSCF takes the role of S-CSCF#2 in the following information flow.

Handling of redirection to a general URL is shown in the following information flow:

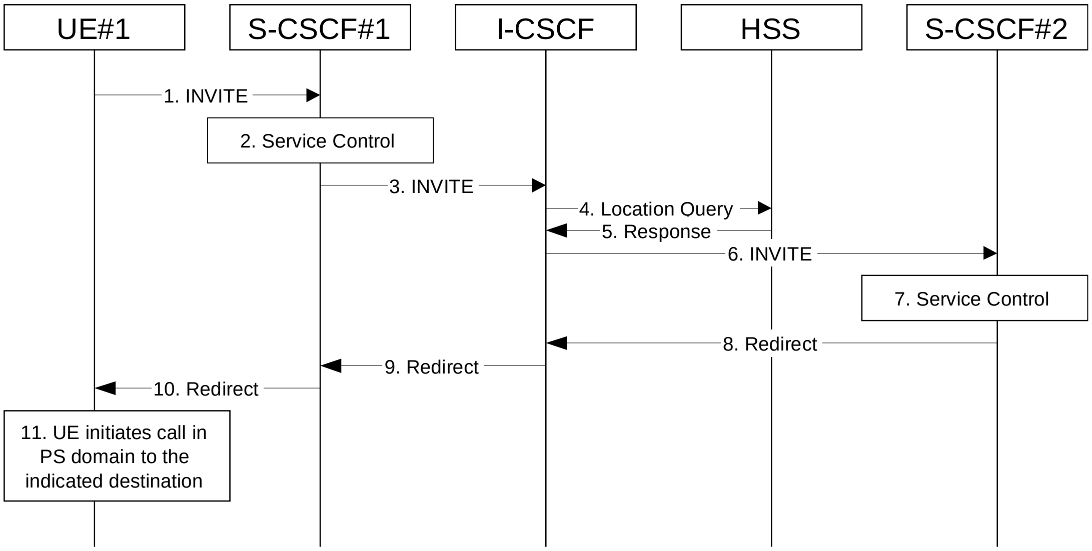

**Figure 5.38: Session redirection initiated by S-CSCF to general endpoint**

Step-by-step processing is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt.
3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. The INVITE message is sent to an I-CSCF for that operator, and may optionally go through an I-CSCF(THIG) if S-CSCF#1 is in a different operator's network than I-CSCF.
4. I-CSCF queries the HSS for current location information of the destination subscriber.
5. HSS responds with the address of the current Serving CSCF (S-CSCF#2) for the terminating subscriber.
6. I-CSCF forwards the INVITE request to S-CSCF#2, who will handle the session termination.
7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt. As a result of this service control logic, S-CSCF#2 determines that the session should be redirected to a new destination URL outside the IMS and outside the CS domain, i.e. other than a sip: or tel: URL.
8. S-CSCF#2 sends a SIP Redirect response back to I-CSCF, with redirection destination being the general URL.
9. I-CSCF sends a Redirect response back to S-CSCF#1, containing the redirection destination.
10. S-CSCF#1 forwards the Redirect response back to UE#1.
11. UE#1 initiates the session to the indicated destination.

*************************************NEXT CHANGE*******************************************

### 5.11.5.6 Session Redirection initiated by originating UE#1 after Bearer Establishment (REDIRECT to originating UE#1)

The UE of the destination subscriber may request the session be redirected after a customer-specified ringing interval. The UE may also implement customer-specific feature processing, and base its decision to redirect this session on such things as 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 signaling path to the originating endpoint, who initiates a session to the new destination.

The service implemented by this information flow is typically "Session Forward No Answer".

Redirect to another IMS endpoint (e.g. a sip: URL) is shown in the following information flow:

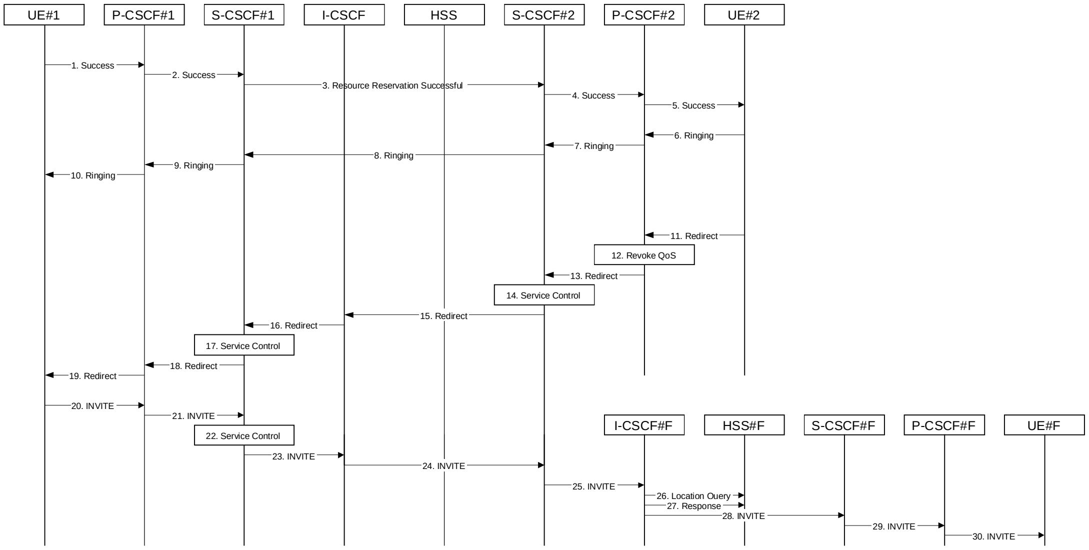

**Figure 5.41: Session redirection after bearer establishment**

Step-by-step processing is as follows:

1-10. Normal handling of a basic session establishment, up through establishment of the bearer channel and alerting of the destination subscriber or by a previous session redirection after bearer establishment procedure.

11. Based on a timeout or other indications, UE#2 decides the current session should be redirected to a new destination URL. This new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. The Redirect response is sent to P-CSCF#2.

12. P-CSCF#2 shall revoke~~s~~ any authorisation for QoS for the current session.

13. P-CSCF#2 forwards the Redirect response to S-CSCF#2.

14. S-CSCF#2 performs whatever service control is appropriate for this session redirection. If UE#2 does not subscribe to session redirection service, or did not supply a new destination URL, S-CSCF#2 may supply one or may terminate the session setup attempt with a failure response. The new destination URL may be a phone number, an email address, a web page, or anything else that can be expressed as a URL. S-CSCF#2 generates a private URL, addressed to itself, containing the new destination.

15. S-CSCF#2 sends a SIP Redirect response back to I-CSCF, containing the private URL addressed to S-CSCF#2.

16. I-CSCF sends a Redirect response back to S-CSCF#1, containing the redirection destination.

17. S-CSCF#1 checks the number of redirections that have occurred for this session setup attempt, and if excessive, aborts the session. S-CSCF#1 stores the new destination information, generates a private URL addressed to itself pointing to the stored information, and generates a modified Redirect response with the private URL.

18. S-CSCF#1 sends the modified Redirect response to P-CSCF#1

19. P-CSCF#1 shall revoke any authorisation for QoS for the current session and sends the Redirect response to UE#1.

20. UE#1 ~~resets and releases all resources for the previous session, and~~ initiates a new INVITE request to the address provided in the Redirect response. The new INVITE request is sent to P-CSCF#1

21. P-CSCF#1 forwards the INVITE request to S-CSCF#1

22. S-CSCF#1 retrieves the destination information saved in step #17, and performs whatever other service control is appropriate for this new session setup attempt.

23. S-CSCF#1 determines the network operator of the new destination address. The INVITE message is sent to I-CSCF#2, the I-CSCF for S-CSCF#2.

24. I-CSCF forwards the INVITE to S-CSCF#2

25. S-CSCF#2 decodes the private URL, determines the network operator of the new destination, and sends the INVITE request to the I-CSCF for that network operator.

26. The remainder of this session completes as normal.

**3GPP TSG-S2 #25** **_Tdoc S2-02~~1730~~1947_**
**Naantali, Finland, 24th - 28th June 2002**

*CR-Form-v5.1*

# CHANGE REQUEST

| | | | | | | |
|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **182** | ⌘ **rev** | **1~~-~~** ⌘ | Current version: **5.5.0** ⌘ |

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

***Proposed change affects:*** ⌘ (U)SIM □ ME/UE □ Radio Access Network □ Core Network ☒

| | | | | |
|---|---|---|---|---|
| ***Title:*** | ⌘ | Policy control procedures on PDP context modification | | |
| ***Source:*** | ⌘ | SK Telecom | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 18th June 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)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | In the current section 5.4.7.5a Indication of PDP context modification, it is described that in case the requested QoS falls outside of the limits that were authorized at PDP context activation(or last modification) then the GGSN just indicates this to the PCF.<br>However, it should be performed to authorize the PDP context modification request in this case and additionally in case the received binding information is new.<br>This changes were already agreed in the last CN3 meeting in Budapest and applied to 29.207 and 29.208 which were approved during the CN#16 plenary, so it is also necessary to be applied to 23.228 |
| ***Summary of change:*** | ⌘ | Split the current contents in section 5.4.7.5a into a case in which authorization is needed and a indication case. The new section 5.4.7.6 describes the authorization of PDP context modification procedure and the section 5.4.7.7 describes the indication of PDP context modification procedure. |
| ***Consequences if not approved:*** | ⌘ | Misalignment between stage-2 and stage-3 |

| | | | |
|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.4.7 | |
| ***Other specs affected:*** | ⌘ | □ Other core specifications<br>□ Test specifications<br>□ O&M Specifications | ⌘ |
| ***Other comments:*** | ⌘ | | |

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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.

## 5.4.7 Interaction between QoS and session signalling

At PDP context setup the user shall have access to either GPRS without service-based local policy, or GPRS with service-based local policy. It is operator choice whether to offer both or only one of these alternatives for accessing the IM Subsystem.

For the GPRS without service-based local policy case, the bearer is established according to the user's subscription, local operator's IP bearer resource based policy, local operator's admission control function and GPRS roaming agreements. The establishment of the PDP context bearer shall use the PDP context activation procedure specified in TS 23.060.

For the GPRS with service-based local policy case, Service-Based Local Policy decisions (e.g., authorisation and control) are also applied to the bearer.

The description in this subsection is applicable for the case when service-based local policy is employed.

The GGSN contains a Policy Enforcement Function (PEF) that has the capability of policing packet flow into the IP network, and restricting the set of IP destinations that may be reached from/through a PDP context according to a packet classifier. This service-based policy 'gate' function has an external control interface that allows it to be selectively 'opened' or 'closed' on the basis of IP destination address and port. When open, the gate allows packets to pass through (to the destination specified in the classifier) and when closed, no packets are allowed to pass through. The control is performed by a PCF, which is a logical entity of the P-CSCF. (Note: If the PCF is implemented in a separate physical node, the interface between the PCF and the P-CSCF is not standardised).

There are ~~seven~~ eight interactions defined for service-based local policy:

1. Authorize QoS Resources.
2. Resource Reservation with Service-based Local Policy.
3. Approval of QoS Commit for resources authorised in (1), e.g. 'open' the 'gate'.
4. Removal of QoS Commit for resources authorised in (1), e.g. 'close' the 'gate'.
5. Revoke Authorisation for GPRS and IP resources.
6. Indication of PDP Context Release from the GGSN to the PCF.
7. Authorization of PDP Context Modification

8~~7~~. Indication of PDP Context Modification from the GGSN to the PCF.

These requirements and functional description of these interactions are explained further in the following sections. The complete specification of the interface between the Policy Control Function and the Policy Enforcement Function is contained in TS 23.207.

### 5.4.7.1 Authorize QoS Resources

The Authorize QoS Resources procedure is used during an establishment of a SIP session. The P-CSCF(PCF) shall use the SDP contained in the SIP signaling to calculate the proper authorisation. The PCF authorizes the required QoS resources.

The authorisation shall include binding information, which shall also be provided by the UE to the GGSN in the allocation request, which enables accurate matching of requests and authorisations. The binding information includes an Authorisation Token sent by the P-CSCF to the UE during SIP signaling, and one or more Flow Identifiers, which are used, by the UE, GGSN and PCF to uniquely identify the media component(s).

The authorisation shall be expressed in terms of the IP resources to be authorised and shall include limits on IP packet flows, and may include restrictions on IP destination address and port.

### 5.4.7.1a Resource Reservation with Service-based Local Policy

The GGSN serves as the Policy Enforcement Point that implements the policy decisions for performing admission control and authorising the GPRS and IP BS QoS Resource request, and policing IP flows entering the external IP network.

Authorisation of GPRS and IP QoS Resources shall be required for access to the IP Multimedia Subsystem. The GGSN shall determine the need for authorisation, possibly based on provisioning and/or based on the APN of the PDP context.

Resource Reservation shall be initiated by the UE, and shall take place only after successful authorisation of QoS resources by the PCF. Resource reservation requests from the UE shall contain the binding information. The use of this binding information enables the GGSN to correctly match the reservation request to the corresponding authorisation. The authorisation shall be 'Pulled' from the PCF by the GGSN when the reservation request is received from the UE. When a UE combines multiple media flows onto a single PDP context, all of the binding information related to those media flows shall be provided in the resource reservation request.

With a request for GPRS QoS resources, the GGSN shall verify the request is less than the sum of the authorised IP resources (within the error tolerance of the conversion mechanism) for all of the combined media flows. With a request for IP QoS resources, the GGSN shall verify the request is less than the authorised IP resources.

The request for GPRS QoS resources may be signaled independently from the request for IP QoS resources by the UE. At the GPRS BS Level, the PDP Context activation shall be used for QoS signaling. At the IP BS Level, RSVP may be used for QoS signaling.

### 5.4.7.2 Approval of QoS Commit

The PCF makes policy decisions and provides an indication to the GGSN about committing the allocated QoS resources for per-session authorisations unless this was done based on service based local policy at the time of the Resource Reservation procedure.

The GGSN enforces the policy decisions. The GGSN may restrict any use of the GPRS resources prior to this indication from the PCF. The GGSN shall restrict any use of the IP resources prior to this indication from the PCF, e.g. by open the gate and enabling the use of resources for the media flow. Based on local policy, GPRS and/or IP resources may be committed at the time they are authorised by the PCF.

### 5.4.7.3 Removal of QoS Commit

The PCF makes policy decisions and provides an indication to the GGSN about revoking commitment for the allocated QoS resources for per-session authorisations. Removal of QoS Commit for GPRS and IP resources shall be sent as a separate decision to the GGSN corresponding to the previous "Approval of QoS commit" request.

The GGSN enforces the policy decisions. The GGSN may restrict any use of the GPRS resources after this indication from the PCF. The GGSN shall restrict any use of the IP resources after this indication from the PCF, e.g. by closing the gate and blocking the media flow.

### 5.4.7.4 Revoke Authorisation for GPRS and IP Resources

At IP multimedia session release, the UE should deactivate the PDP context(s) used for the IP multimedia session. In various cases, such as loss of signal from the mobile, the UE will be unable to perform this release itself. The Policy Control Function provides indication to the GGSN when the resources previous authorised, and possibly allocated by the UE, are to be released. The GGSNshall deactivate the PDP context used for the IP multimedia session.

### 5.4.7.5 Indication of PDP Context release

Any release of a PDP Context that was established based on authorisation from the PCF shall be reported to the PCF by the GGSN.

This indication may be used by the PCF to initiate a session release towards the remote endpoint.

#### 5.4.7.6 Authorization of PDP Context modification

When a PDP Context is modified such that the requested QoS falls outside of the limits that were authorized at PDP context activation(or last modification) or such that new binding information is received then the GGSN shall verify the authorization of this PDP context modification.

If the GGSN does not have sufficient information to authorize the PDP context modification request, the GGSN shall send an authorization request to the PCF.

#### 5.4.7.7~~5a~~ Indication of PDP Context modification

When a PDP Context is modified such that ~~the requested QoS falls outside of the limits that were authorized at PDP context activation (or last modification) or such that~~ the maximum bit rate (downlink and uplink) is downgraded to 0 kbit/s or changed from 0 kbit/s to a value that falls within the limits that were authorized at PDP context activation(or last modification)then the GGSN shall report this to the PCF.

This indication may be used by the PCF to initiate a session release towards the remote endpoint.

#### ~~5.4.7.6 void~~

#### ~~5.4.7.7 void~~

**3GPP TSG-SA2 Meeting #25**
**Nådendal, Finland, 24.-28.6.2002**

***Tdoc* ⌘*S2-022037***
(Revised S2-022035, 1998, 1908, 1786)

*CR-Form-v7*

# CHANGE REQUEST

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **183** | ⌘**rev** | **5** | ⌘ | Current version: | **5.5.0** ⌘ |

*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:*** | ⌘ | Location information in IMS | | |
| ***Source:*** | ⌘ | Vodafone | | |
| ***Work item code:*** | ⌘ | IMS-CCR, LCS 1 | ***Date:*** ⌘ | 28/06/2002 |
| ***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 the context of the stage-2 description of the Sh interface location information has been defined on a quite general level. This has caused some confusion during the stage-3 work of the Sh interface and has resulted in conflicts with the Location Based Services architecture. |
| ***Summary of change:*** | ⌘ | The sub-clause defining the Sh interface functionalities has been clarified with respect to location information transfer. |
| ***Consequences if not approved:*** | ⌘ | Contradiction and conflict between the Sh interface functions and the LCS architecture. |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 2, 3.2, 3.3, 4.2.4a | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | **X** | | Other core specifications | ⌘ | TS29.328, 29.329 |
| | | | | Test specifications | | |
| | | | | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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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 changed section >>

# 2 References

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

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

[1] 3GPP TS 23.002: "Network Architecture".

[2] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[3] CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterisation of services supported by an ISDN".

[4] ITU Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN"

[5] GSM 03.64: "Digital cellular telecommunication system (Phase 2+); Overall Description of the General Packet Radio Service (GPRS) Radio Interface; Stage 2".

[6] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[7] 3GPP TS 23.221: "Architectural Requirements".

[8] 3GPP TS 22.228: "Service requirements for the IP multimedia core network subsystem"

[9] 3GPP TS 23.207: "End-to-end QoS concept and architecture"

[10] 3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP"

[11] 3GPP TS 25.301: "Radio interface protocol architecture"

[12] RFC 3261: "SIP: Session Initiation Protocol"

[13] RFC 2396: "Uniform Resource Identifiers (URI): Generic Syntax"

[14] RFC 2486: "The Network Access Identifier"

[15] RFC 2806: "URLs for Telephone Calls"

[16] RFC 2916: "E.164 number and DNS"

[16a] RFC 3041: "Privacy Extensions for Stateless Address Autoconfiguration in IPv6"

[17] ITU Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies"

[18] ITU Recommendation H.248: "Gateway control protocol"

[19] 3GPP TS 33.203: "Access Security for IP-based services"

[20] 3GPP TS 33.210: "Network Domain Security: IP network layer security "

[21] 3GPP TS 26.235: "Packet Switched Multimedia Applications; Default Codecs".

[22] 3GPP TR 22.941: " IP Based Multimedia Services Framework "

[23] 3GPP TS 23.060: “General Packet Radio Service (GPRS); Service description; Stage 2

[24] 3GPP TS 23.003: “Technical Specification Group Core Network; Numbering, addressing and identification”

[25] 3GPP TS 32.200: “Telecommunication management; Charging management; Charging principles”

[26] 3GPP TS 32.225: ” Telecommunication Management; Charging Management; Charging Data Description for IP Multimedia Subsystem”

[28] 3GPP TS 23.271: “Technical Specification Group Services and System Aspects, Functional stage 2 description of LCS”

[29] 3GPP TS 23.078: “Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 - Stage 2”

[27] 3GPP TS 22.071: “Technical Specification Group Services and System Aspects, Location Services (LCS); Service description, Stage 1”

# << Next changed section >>

## 3.2 Symbols

For the purposes of the present document the following symbols apply:

| | |
|---|---|
| Cx | Reference Point between a CSCF and an HSS. |
| Dx | Reference Point between an I-CSCF and an SLF. |
| Gi | Reference point between GPRS and an external packet data network Gm Reference Point between a UE and a P-CSCF. |
| ISC | Reference Point between a CSCF and an Application Server.Iu Interface between the RNS and the core network. It is also considered as a reference point. |
| Le | Reference Point between an AS and a GMLC |
| Mb | Reference Point to IPv6 network services. |
| Mg | Reference Point between an MGCF and a CSCF. |
| Mi | Reference Point between a CSCF and a BGCF. |
| Mj | Reference Point beetween a BGCF and an MGCF. |
| Mk | Reference Point betweeen a BGCF and another BGCF. |
| Mm | Reference Point between a CSCF and an IP multimedia network. |
| Mr | Reference Point between an CSCF and an MRFC. |
| Mw | Reference Point between a CSCF and another CSCF. |
| Sh | Reference Point between an AS (SIP-AS or OSA-CSCF) and an HSS. |
| Si | Reference Point between an IM-SSF and an HSS. |

# << Next changed section >>

## 3.3 Abbreviations

For the purposes of the present document the following abbreviations apply. Additional applicable abbreviations can be found in GSM 01.04 [1].

| | |
|---|---|
| AMR | Adaptive Multi-rate |
| API | Application Program Interface |
| AS | Application Server |
| BCSM | Basic Call State Model |
| BG | Border Gateway |
| BGCF | Breakout Gateway Control Function |
| BS | Bearer Service |
| CAMEL | Customised Application Mobile Enhanced Logic |
| CAP | Camel Application Part |
| CDR | Charging DataRecord |
| CN | Core Network |
| CS | Circuit Switched |
| CSCF | Call Session Control Function |
| CSE | CAMEL Service Environment |
| DHCP | Dynamic Host Configuration Protocol |
| DNS | Domain Name System |
| ENUM | E.164 Number |
| GGSN | Gateway GPRS Support Node |
| GMLC | Gateway Mobile Location Centre |
| HSS | Home Subscriber Server |
| I-CSCF | Interrogating-CSCF |
| IETF | Internet Engineering Task Force |
| IM | IP Multimedia |
| IM CN SS | IP Multimedia Core Network Subsystem |
| IMS | IP Multimedia Core Network Subsystem |
| IMSI | International Mobile Subscriber Identifier |
| IP | Internet Protocol |
| IPv4 | Internet Protocol version 4 |
| IPv6 | Internet Protocol version 6 |
| ISDN | Integrated Services Digital Network |

| | |
|---|---|
| ISIM | IMS SIM |
| ISP | Internet Service Provider |
| ISUP | ISDN User Part |
| MAP | Mobile Application Part |
| MGCF | Media Gateway Control Function |
| MGF | Media Gateway Function |
| NAI | Network Access Identifier |
| OSA | Open Services Architecture |
| P-CSCF | Proxy-CSCF |
| PCF | Policy Control Function |
| PDN | Packet Data Network |
| PDP | Packet Data Protocol e.g., IP |
| PEF | Policy Enforcement Function |
| PLMN | Public Land Mobile Network |
| PSTN | Public Switched Telephone Network |
| QoS | Quality of Service |
| RAB | Radio Access Bearer |
| RFC | Request for Comments |
| SCS | Service Capability Server |
| S-CSCF | Serving-CSCF |
| SGSN | Serving GPRS Support Node |
| SLF | Subscription Locator Function |
| SSF | Service Switching Function |
| SS7 | Signalling System 7 |
| SIM | Subscriber Identity Module |
| SIP | Session Initiation Protocol |
| SGW | Signalling Gateway |
| THIG | Topology Hiding Inter-network Gateway |
| UE | User Equipment |
| UMTS | Universal Mobile Telecommunications System |
| URL | Universal Resource Locator |
| USIM | UMTS SIM |

<< Next changed section >>

## 4.2.4a HSS to service platform Interface

The "application server" (SIP Application Server and/or the OSA service capability server and/or IM-SSF) may communicate to the HSS. The Sh and Si interfaces are used for this purpose. The Sh and Si interfaces are shown in Figure 4.3.

For the Sh interface, the following shall apply:

1 The Sh interface is an intra-operator interface.

2. The Sh interface is between the HSS and the "SIP application server" and between the HSS and the "OSA service capability server". The HSS is responsible for policing what information will be provided to each individual application server.

3 The Sh interface transports transparent data for e.g. service related data , user related information, …
In this case, the term transparent implies that the exact representation of the information is not understood by the HSS or the protocol.

4 The Sh interface also supports mechanisms for transfer of user related data stored in the HSS (e.g. user service related data, MSISDN, visited network capabilities, user location (cell global ID/SAI or the address of the serving network element, etc))

Note: before providing information relating to the location of the user to a SIP Application Server, detailed privacy checks frequently need to be performed in order to meet the requirements in TS22.071 [27]. The SIP Application Server can ensure that these privacy requirements are met by using the Le interface to the GMLC (see TS 23.271) instead of using the Sh interface.

The Si interface is between the HSS and the IM-SSF. It transports CAMEL subscription information including triggers for use by CAMEL based application services.

**3GPP TSG–SA2 Meeting #26**
**Toronto, Canada, 19th to 23th August 2002**

***Tdoc* ⌘S2-022529~~2109~~**

CR-Form-v7

# CHANGE REQUEST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **185** | ⌘**rev** | **-** | ⌘ Current version: | **5.5.0** ⌘ |

*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:*** | ⌘ | Re-registration procedure for user currently registered | | |
| ***Source:*** | ⌘ | Orange | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 06/08/2002 |
| ***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:*** ⌘ It is unclear in the "Re-registration information flow – User currently registered" procedure how to act when a session is still active while the registration timer expires at the UE.

***Summary of change:*** ⌘ In that case, the procedure forces the mobile to re-register using the "Re-registration information flow – User currently registered". Otherwise, the "Network Initiated Application (SIP) De-registration, Registration Timeout" will apply afterwards (because the UE shall keep a timer shorter than the registration related timer in the network).

***Consequences if not approved:*** ⌘ The mobile may be de-registered by the network although sessions are still active.

***Clauses affected:*** ⌘ 5.2.2.4 Re-Registration information flow – User currently registered

***Other specs affected:*** ⌘

| Y | N | | |
|---|---|---|---|
| | X | Other core specifications | ⌘ |
| | X | Test specifications | |
| | X | O&M Specifications | |

***Other comments:*** ⌘

**How to create CRs using this form:**
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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 containin

### 5.2.2.4 Re-Registration information flow – User currently registered

Periodic application level re-registration is initiated by the UE either to refresh an existing registration or in response to a change in the registration status of the UE. Re-registration follows the same process as defined in subclause 5.2.2.3 “Registration Information Flow – User not registered”. When initiated by the UE, based on the registration time established during the previous registration, the UE shall keep a timer shorter than the registration related timer in the network.

Note: if the UE does not re-register, any active sessions may be deactivated.

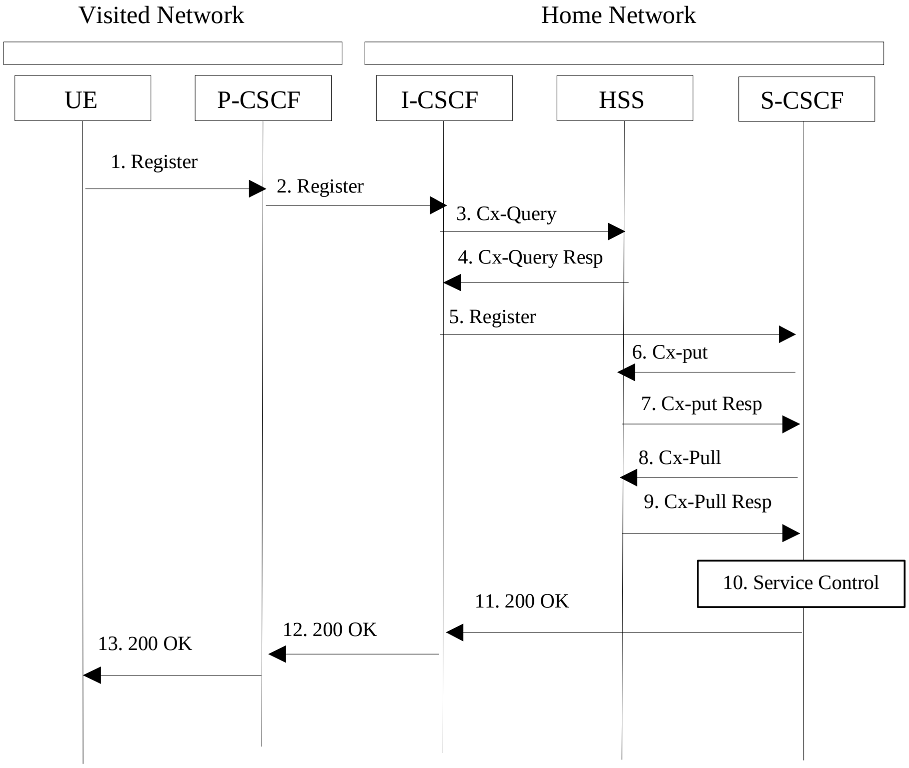

**Figure 5.2: Re-registration - user currently registered**

1. Prior to expiry of the agreed registration timer, the UE initiates a re-registration. To re-register, the UE sends a new REGISTER request. The UE sends the REGISTER information flow to the proxy (public user identity, private user identity, home network domain name, UE IP address).

2. Upon receipt of the register information flow, the P-CSCF shall examine the “home domain name” to discover the entry point to the home network (i.e. the I-CSCF). The proxy does not use the entry point cached from prior registrations. The proxy shall send the Register information flow to the I-CSCF (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address). A name-address resolution mechanism is utilised in order to determine the address of the home network from the home domain name. The P-CSCF network identifier is a string that identifies at the home network, the network where the P-CSCF is located (e.g., the P-CSCF network identifier may be the domain name of the P-CSCF network).

3. The I-CSCF shall send the Cx-Query information flow to the HSS (public user identity, private user identity and P-CSCF network identifier).

4. The HSS shall check whether the user is registered already and return an indication indicating that an S-CSCF is assigned. The Cx-Query Resp (indication of entry contact point, e.g. S-CSCF) is sent from the HSS to the I-CSCF.

5. The I-CSCF, using the name of the S-CSCF, shall determine the address of the S-CSCF through a name-address resolution mechanism. The I-CSCF also determines the name of a suitable home network contact point, possibly based on information received from the HSS. The home network contact point may either be the S-CSCF itself, or a suitable I-CSCF(THIG) in case network configuration hiding is desired. If an I-CSCF(THIG) is chosen as

the home network contact point for implementing network configuration hiding, it may be distinct from the I-CSCF that appears in this registration flow, and it shall be capable of deriving the S-CSCF name from the home contact information. I-CSCF shall then send the register information flow (P-CSCF address/name, public user identity, private user identity, P-CSCF network identifier, UE IP address, I-CSCF(THIG) in case network configuration hiding is desired) to the selected S-CSCF. The home network contact point will be used by the P-CSCF to forward session initiation signalling to the home network.

6. The S-CSCF shall send Cx-Put (public user identity, private user identity, S-CSCF name) to the HSS. The HSS stores the S-CSCF name for that subscriber. Note: Optionally as an optimisation, the S-CSCF can detect that this is a re-registration and omit the Cx-Put request.

7. The HSS shall send Cx-Put Resp to the S-CSCF to acknowledge the sending of Cx-Put.

8. On receipt of the Cx-Put Resp information flow, the S-CSCF shall send the Cx-Pull information flow (public user identity, private user identity) to the HSS in order to be able to download the relevant information from the subscriber profile to the S-CSCF. The S-CSCF shall store the P-CSCF address/name, as supplied by the visited network. This represents the address/name that the home network forwards the subsequent terminating session signalling to for the UE. Note: Optionally as an optimisation, the S-CSCF can detect that this a re-registration and omit the Cx-Pull request.

9. The HSS shall return the information flow Cx-Pull-Resp (user information) to the S-CSCF. The S-CSCF shall store the user information for that indicated user.

10. Based on the filter criteria, the S-CSCF shall send re-registration information to the service control platform and perform whatever service control procedures are appropriate.

11. The S-CSCF shall return the 200 OK information flow (home network contact information) to the I-CSCF. If an I-CSCF is chosen as the home network contact point for implementing network configuration hiding, the I-CSCF shall encrypt the S-CSCF address in the home network contact information.

12. The I-CSCF shall send information flow 200 OK (home network contact information) to the P-CSCF. The I-CSCF shall release all registration information after sending information flow 200 OK.

13. The P-CSCF shall store the home network contact information, and shall send information flow 200 OK to the UE.

Note: The encryption mechanism for implementing network configuration hiding is specified in TS 33.203.

**3GPP TSG-SA2 Meeting #26**
**Toronto, Canada 19th – 2nd August**

***Tdoc S2-022643***

*CR-Form-v7*

# CHANGE REQUEST

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | 188 | ⌘ **rev** | **2** | ⌘ | Current version: | **5.5.0** ⌘ |

*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:*** | ⌘ | Support of originating requests from Application Servers | | |
| ***Source:*** | ⌘ | dynamicsoft | | |
| ***Work item code:*** | ⌘ | IMS | ***Date:*** ⌘ | August 22, 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:*** | ⌘ | TS 23.228 and TS 23.218 clearly specifies that Application Servers may originate requests however it is not clearly stated that Filter Criteria should be evaluated when the S-CSCF receives an initial request from an Application Server. |
| ***Summary of change:*** | ⌘ | Modified clause 4.2.4 to include requests originated from an Application Server in the terminating case when the served user is not registered. |
| ***Consequences if not approved:*** | ⌘ | Inconsistent behaviour in S-CSCF implementations for initial request received from application servers and failures of application server originated SIP requests. |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 4.2.4 | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | X | | Other core specifications | ⌘ | 23.218, 24.229 |
| | | | X | Test specifications | | |
| | | | X | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the

**FIRST MODIFICATION**

### 4.2.4 IP multimedia Subsystem Service Control Interface (ISC)

The ISC interface is between the Serving CSCF and the service platform(s).

An Application Server (AS) offering value added IM services resides either in the user's home network or in a third party location. The third party could be a network or simply a stand-alone AS.

The Serving-CSCF to AS interface is used to provide services residing in an AS. Two cases were identified:

- Serving-CSCF to an AS in Home Network.
- Serving-CSCF to an AS in External Network (e.g., Third Party or Visited)

Regarding the general provision of services in the IMS, the following statements shall guide the further development.

1. Besides the Cx interface the S-CSCF supports only one standardised protocol for service control, which delegates service execution to an “Application Server”.
2. The depicted functional architecture does not propose a specific physical implementation.
3. Scope of the SIP Application Server: the SIP Application Server may host and execute services. It is intended to allow the SIP Application Server to influence and impact the SIP session on behalf of the services and it uses the ISC interface to communicate with the S-CSCF.
4. The S-CSCF shall decide whether an Application Server is required to receive information related to an incoming SIP session request to ensure appropriate service handling.. The decision at the S-CSCF is based on (filter) information received from the HSS (or other sources, e.g. application servers). This filter information is stored and conveyed on a per application server basis for each subscriber. The name(s)/address(es) information of the application server(s) are received from the HSS.
5. The purpose of the IM SSF is to host the CAMEL network features (i.e. trigger detection points, CAMEL Service Switching Finite State Machine, etc) and to interface to CAP.
6. The IM SSF and the CAP interface support legacy services only.
7. Once the IM SSF, OSA SCS or SIP Application Server has been informed of a SIP session request by the S-CSCF, the IM SSF, OSA SCS or SIP Application Server shall ensure that the S-CSCF is made aware of any resulting activity by sending messages to the S-CSCF.
8. From the perspective of the S-CSCF, The “SIP Application server”, “OSA service capability server” and “IM-SSF” shall exhibit the same interface behaviour.
9. The application server may contain “service capability interaction manager” (SCIM) functionality and other application servers. The SCIM functionality is an application which performs the role of interaction management. The internal components are represented by the “dotted boxes” inside the SIP application server. The internal structure of the application server is outside the standards.  
   The Sh interface shall have sufficient functionality to enable this scenario.
10. When the name/address of more than one “application server” is transferred from the HSS, the S-CSCF shall contact the “application servers” in the order supplied by the HSS. The response from the first “application server” shall be used as the input to the second “application server”. Note that these multiple “application servers” may be any combination of the SIP Application server, OSA service capability server, or IM-SSF types.
11. The S-CSCF does not handle service interaction issues..
12. The S-CSCF does not provide authentication and security functionality for secure direct third party access to the IM subsystem. The OSA framework provides a standardized way for third party secure access to the IM subsystem.

12a. If a S-CSCF receives a SIP request on the ISC interface that was originated by an Application Server destined to a user served by that S-CSCF, then the S-CSCF shall treat the request as a terminating request to that user and provide the terminating request functionality as described in items 4 and 10 above. Both registered and unregistered terminating requests shall be supported.

13. More specifically the following requirements apply to the IMS Service control interface:

1. The ISC interface shall be able to convey charging information.
2. The protocol on the ISC interface shall support the control of timers
3. The protocol on the ISC interface shall allow the S-CSCF to differentiate between ~~session control~~SIP requests on Mw, Mm and Mg interfaces and SIP Requests on the ISC interface.

The figure below depicts an overall view of how services can be provided.

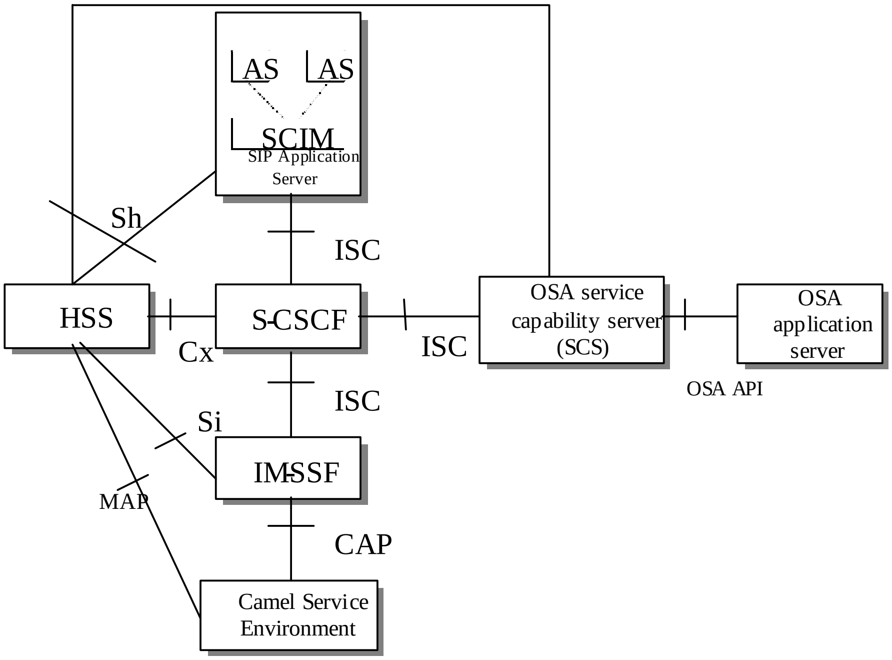

**Figure 4.3: Functional architecture for the provision of service in the IMS**

The protocol to be used on the ISC interface shall be SIP (as defined by RFC 3261 [12], other relevant RFC’s, and additional enhancements introduced to support 3GPP´s needs on the Mw, Mm, Mg interfaces). On the ISC interface, extensions to SIP shall be avoided but are not expressly prohibited.

The same SIP leg (as defined by the “Call-id”, “To” and “From” information fields, with the associated “tag” information fields) that is received by the S-CSCF on the Mw, Mm and Mg interfaces is sent on the ISC interface. The same SIP leg (as defined by the “Call-id”, “To” and “From” information fields, with the associated “tag” information fields) that is received by the S-CSCF on the ISC interface is sent on the Mw, Mm and Mg interfaces.

Concerning the relationship between the SIP legs of the ISC interface and the SIP legs of the Mw, Mm, and Mg interfaces the S-CSCF acts as a SIP proxy, as shown in Figures 4.a-4e below.

Figures 4.3a-4.3e below depict the possible high-level interactions envisioned between the S-CSCF and the Application Server.

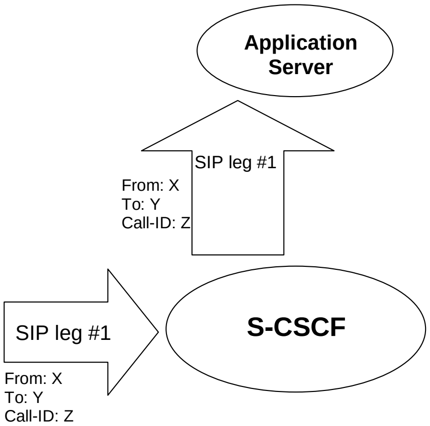

**Figure 4.3a: Application Server acting as terminating UA, or redirect server**

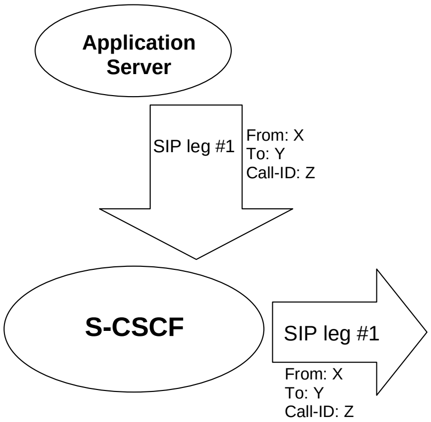

**Figure 4.3b: Application Server acting as originating UA**

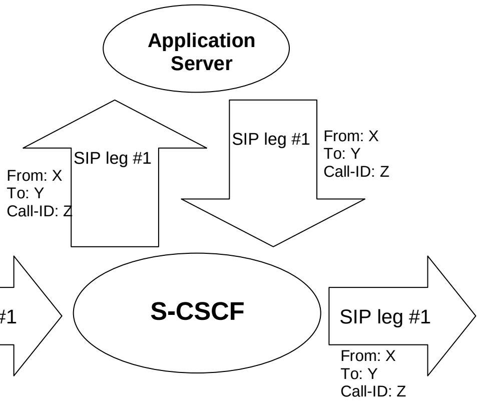

**Figure 4.3c: Application Server acting as a SIP proxy**

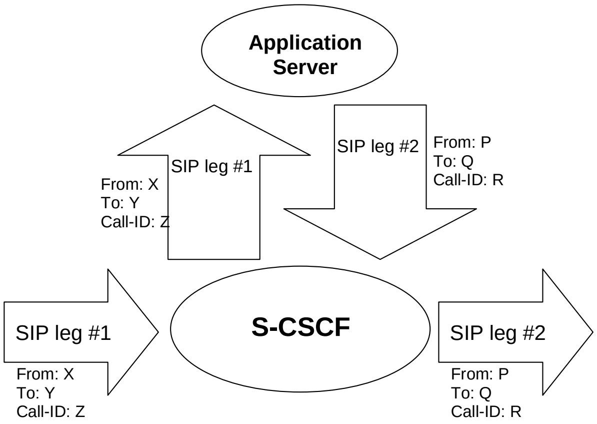

Figure 4.3d: Application Server performing 3rd party call control

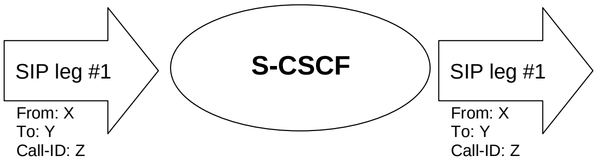

Figure 4.3e: A SIP leg is passed through the S-CSCF without Application Server involvement

**3GPP TSG-SA2 Meeting #26** **_Tdoc S2-022642_**
**Toronto, Canada, August 19, 2002**

*CR-Form-v4*

# CHANGE REQUEST

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **195** | ⌘ | rev | **2** | ⌘ | Current version: | **5.5.0** | ⌘ |

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

***Proposed change affects:*** ⌘ (U)SIM □ ME/UE □ Radio Access Network □ Core Network ☒

| | | | | |
|---|---|---|---|---|
| ***Title:*** | ⌘ | Updates to unify draft changes | | |
| ***Source:*** | ⌘ | Lucent Technologies | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 19.08.2002 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | REL-5 |
| | | *Use one of the following categories:*<br>***F*** *(correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(addition of feature),*<br>***C*** *(functional modification of feature)*<br>***D*** *(editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | This set of changes is being made to improve the information flow layouts and to change some terminology to improve the readability of the changes that were made to address the IETF Unify draft. |
| ***Summary of change:*** | ⌘ | Several of the information flows are redrawn to allow them to fit on a single page and the associated text was changed to improve readability. |
| ***Consequences if not approved:*** | ⌘ | Possible incorrect implementation of IMS. |

| | | | |
|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.6.1, 5.6.2, 5.6.3, 5.7.1, 5.7.2, 5.7.2a, 5.7.3, | |
| ***Other specs affected:*** | ⌘ | □ Other core specifications<br>□ Test specifications<br>□ O&M Specifications | ⌘ |
| ***Other comments:*** | ⌘ | | |

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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.

### 5.5.1 (S-S#1) Different network operators performing origination and termination

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines that it belongs to a subscriber of a different operator. The request is therefore forwarded (optionally through an an I-CSCF(THIG) within the originating operator's network) to a well-known entry point in the destination operator's network, the I-CSCF. The I-CSCF queries the HSS for current location information, and finds the subscriber either located in the home service area, or roaming. The I-CSCF therefore forwards the request to the S-CSCF serving the destination subscriber.

Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming. The "Originating Network" of S-S#1 is therefore a visited network.

MO#2 Mobile origination, home. The "Originating Network" of S-S#1 is therefore the home network.

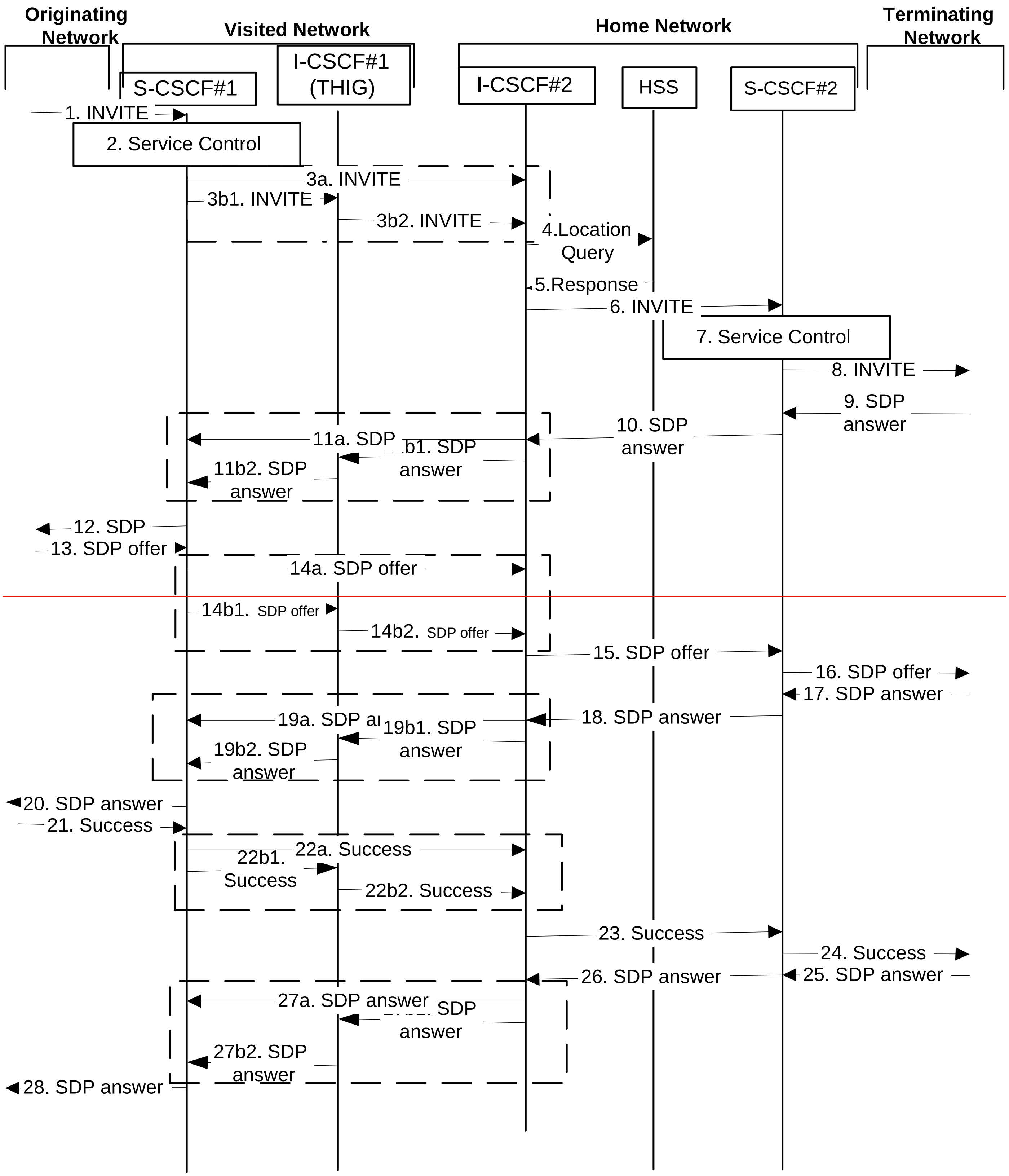
PSTN-O PSTN origination. The "Originating Network" of S-S#1 is the home network. The element labeled S-CSCF#1 is the MGCF of the PSTN-O procedure.

Termination sequences that share this common S-S procedure are:

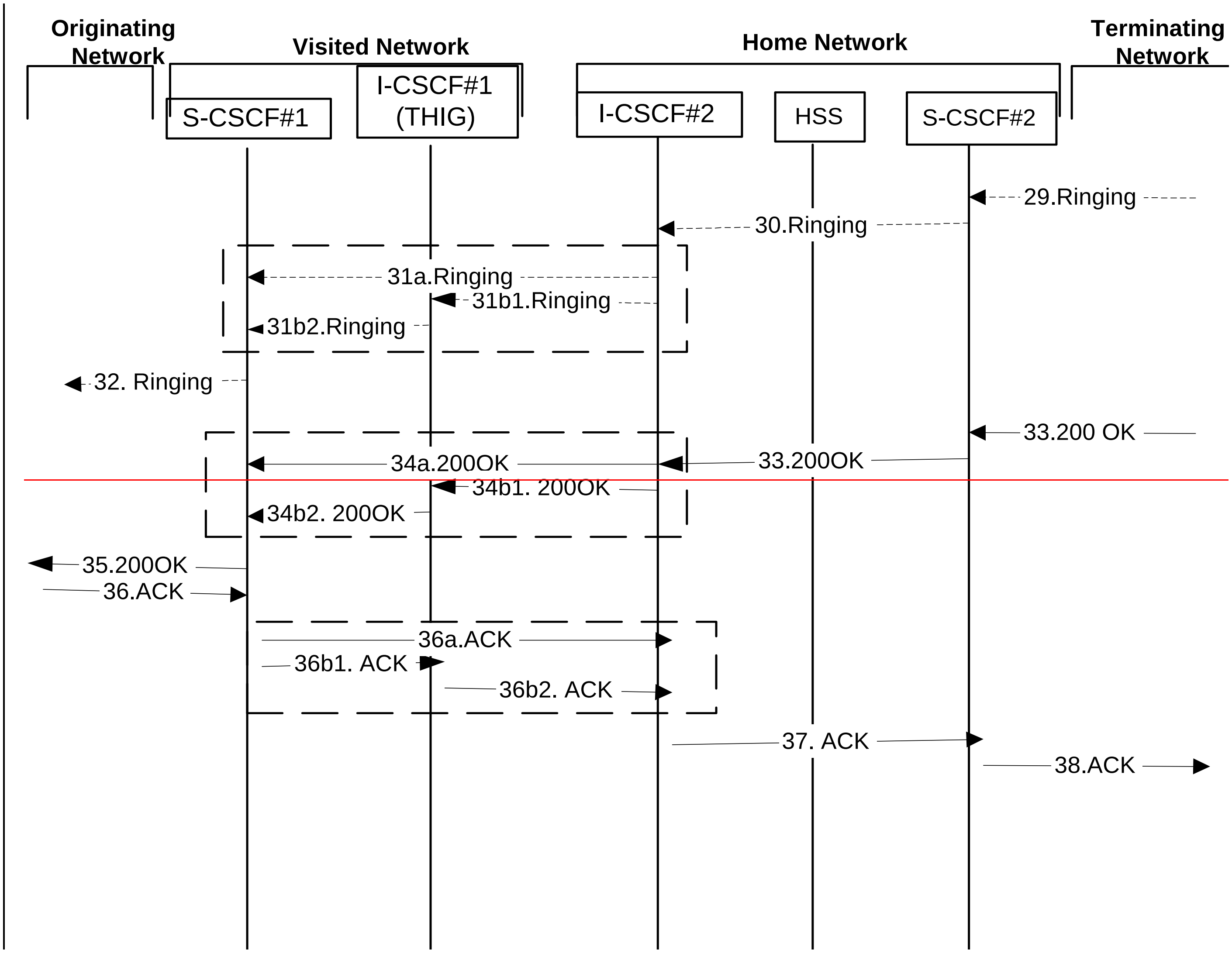
MT#1 Mobile termination, roaming. The "Terminating Network" of S-S#1 is a visited network.

MT#2 Mobile termination, located in home service area. The "Terminating Network" of S-S#1 is the home network.

MT#3 Mobile termination, CS Domain roaming. The "Terminating Network" of S-S#1 is a CS domain network.



~~**Figure 5.10-1: Serving to serving procedure - different operators (part 1)**~~


Originating Network
Visited Network
Home Network
Terminating Network
S-CSCF#1
I-CSCF#1 (THIG)
I-CSCF#2
HSS
S-CSCF#2
29.Ringing
30.Ringing
31a.Ringing
31b1.Ringing
31b2.Ringing
32. Ringing
33.200 OK
34a.200OK
33.200OK
34b1. 200OK
34b2. 200OK
35.200OK
36.ACK
36a.ACK
36b1. ACK
36b2. ACK
37. ACK
38.ACK

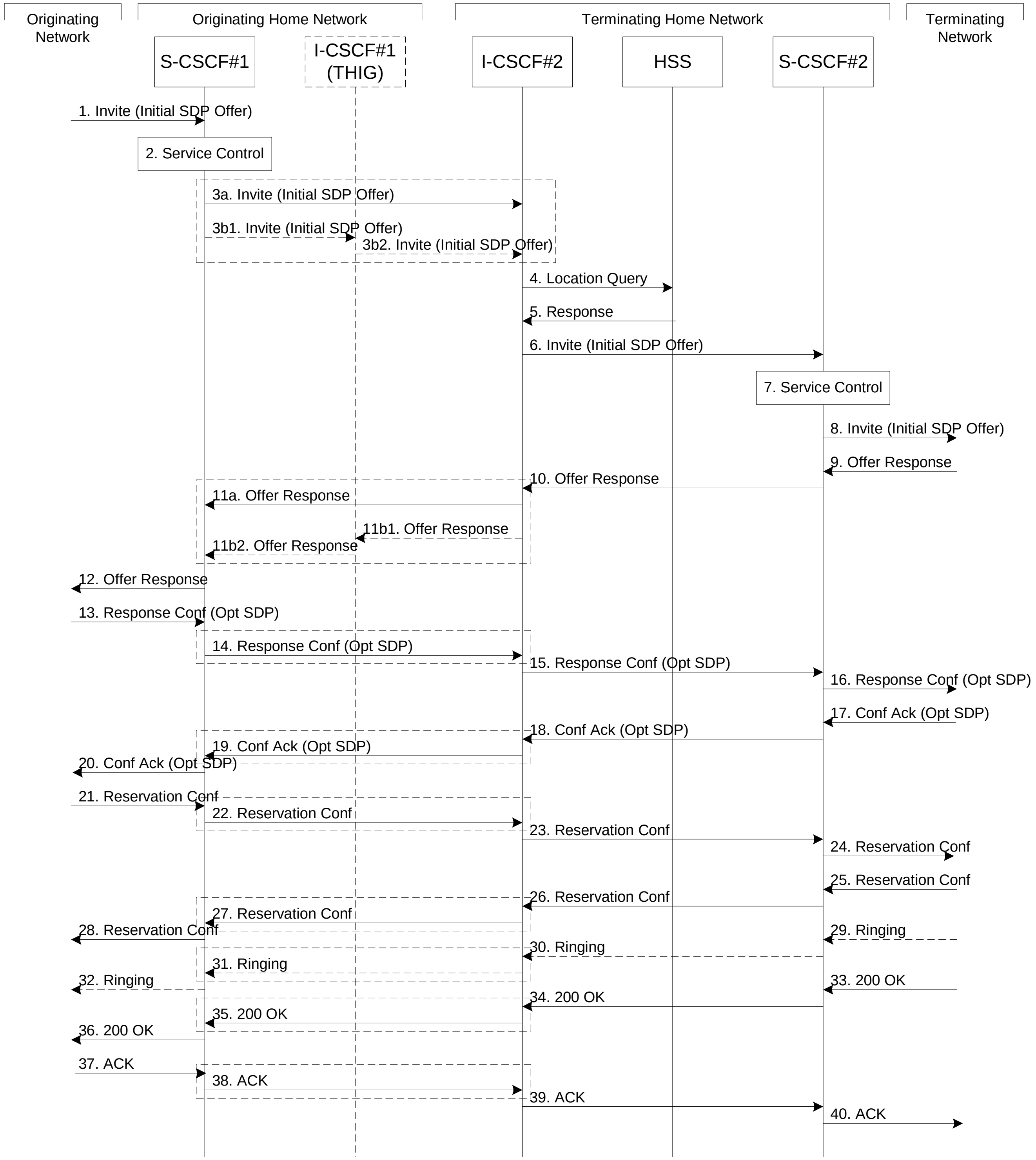


**Figure 5.10~~-2~~: Serving to serving procedure - different operators~~ (part 2)~~**

Procedure S-S#1 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow. This message should contain the initial media description offer in the SDP.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session attempt.

3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. For S-S#1, this flow ~~(2)~~ is an inter-operator message to the I-CSCF entry point for the terminating subscriber. If the originating operator desires to keep their internal configuration hidden, then S-CSCF#1 forwards the INVITE request through I-CSCF(THIG)#1 (choice (b)); otherwise S-CSCF#1 forwards the INVITE request directly to I-CSCF#2, the well-known entry point into the terminating subscriber's network (choice (a)).

   (3a) If the originating network operator does not desire to keep their network configuration hidden, the INVITE request is sent directly to I-CSCF#2.

   (3b) If the originating network operator desires to keep their network configuration hidden, the INVITE request is forwarded through an I-CSCF(THIG) in the originating operator's network, I-CSCF(THIG)#1.

   (3b1) The INVITE request is sent from S-CSCF#1 to I-CSCF(THIG)#1

   (3b2) I-CSCF(THIG)#1 performs the configuration-hiding modifications to the request and forwards it to I-CSCF#2

4. I-CSCF#2 (at the border of the terminating subscriber's network) may query the HSS for current location information. If I-CSCF#2 cannot determine, based on analysis of the destination number, that the HSS query will fail, then it will send "Cx-location-query" to the HSS to obtain the location information for the destination. If I-CSCF#2 can determine, based on analysis of the destination number, that the HSS query will fail, it will not send the "Cx-location-query" message, allocate a MGCF for a PSTN termination, and continue with step #6.

5. HSS responds with the address of the current Serving-CSCF for the terminating subscriber.

6. I-CSCF#2 forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt

8. The sequence continues with the message flows determined by the termination procedure.

9. The media stream capabilities of the destination are returned along the signalling path, as per the termination procedure.

10. S-CSCF#2 forwards the SDP to I-CSCF#2

11. I-CSCF#2 forwards the SDP to S-CSCF#1. Based on the choice made in step #3 above, this may be sent directly to S-CSCF#1 (11a) or may be sent through I-CSCF(THIG)#1 (11b1 and 11b2)

12. S-CSCF#1 forwards the SDP to the originator, as per the originating procedure.

13. The originator decides on the offered set of media streams, confirms receipt of the Offer Response with a Response Confirmation, and forwards this information to S-CSCF#1 by the origination procedures. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 12 or a subset.

14-15. S-CSCF#1 forwards the offered SDP to S-CSCF#2. This may possibly be routed through I-CSCF#1and/or I-CSCF#2 depending on operator configuration of the I-CSCFs. Step 14 may be similar to Step 3 depending on whether or not configuration hiding is used.

16. S-CSCF#2 forwards the offered SDP to the terminating endpoint, as per the termination procedure

17-20 The terminating end point acknowledges the offer with answered SDP and passes through the session path to the originating end point.. Step 19 may be similar to Step 11 depending on whether or not configuration hiding is being used.

21-24. Originating end point acknowledges successful resource reservation and the message is forwarded to the terminating end point. This may possibly be routed through I-CSCF#1and/or I-CSCF#2 depending on operator configuration of the I-CSCFs. Step 22 may be similar to Step 3 depending on whether or not configuration hiding is used.

25-28. Terminating end point acknowledges the response and this message is sent to the originating end point through the established session path. Step 27 may be similar to Step 11 depending on whether or not configuration hiding is being used.

29-32. Terminating end point then generates ringing and this message is sent to the originating end point through the established session path. Step 31 may be similar to Step 11 depending on whether or not configuration hiding is being used.

33-~~35~~36. Terminating end point then sends 200 OK via the established session path to the originating end point. Step 35 may be similar to Step 11 depending on whether or not configuration hiding is being used.

~~36~~37-~~38~~40. Originating end point acknowledges the establishment of the session and sends to the terminating end point via the established session path. This may possibly be routed through I-CSCF#1and/or I-CSCF#2 depending on operator configuration of the I-CSCFs. Step 38 may be similar to Step 3 depending on whether or not configuration hiding is used.

### 5.5.2 (S-S#2) Single network operator performing origination and termination

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines that it belongs to a subscriber of the same operator. The request is therefore forwarded to a local I-CSCF. The I-CSCF queries the HSS for current location information, and finds the subscriber either located in the home service area, or roaming. The I-CSCF therefore forwards the request to the S-CSCF serving the destination subscriber.

Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming,. The “Originating Network” of S-S#2 is therefore a visited network.

MO#2 Mobile origination, home. The “Originating Network” of S-S#2 is therefore the home network.

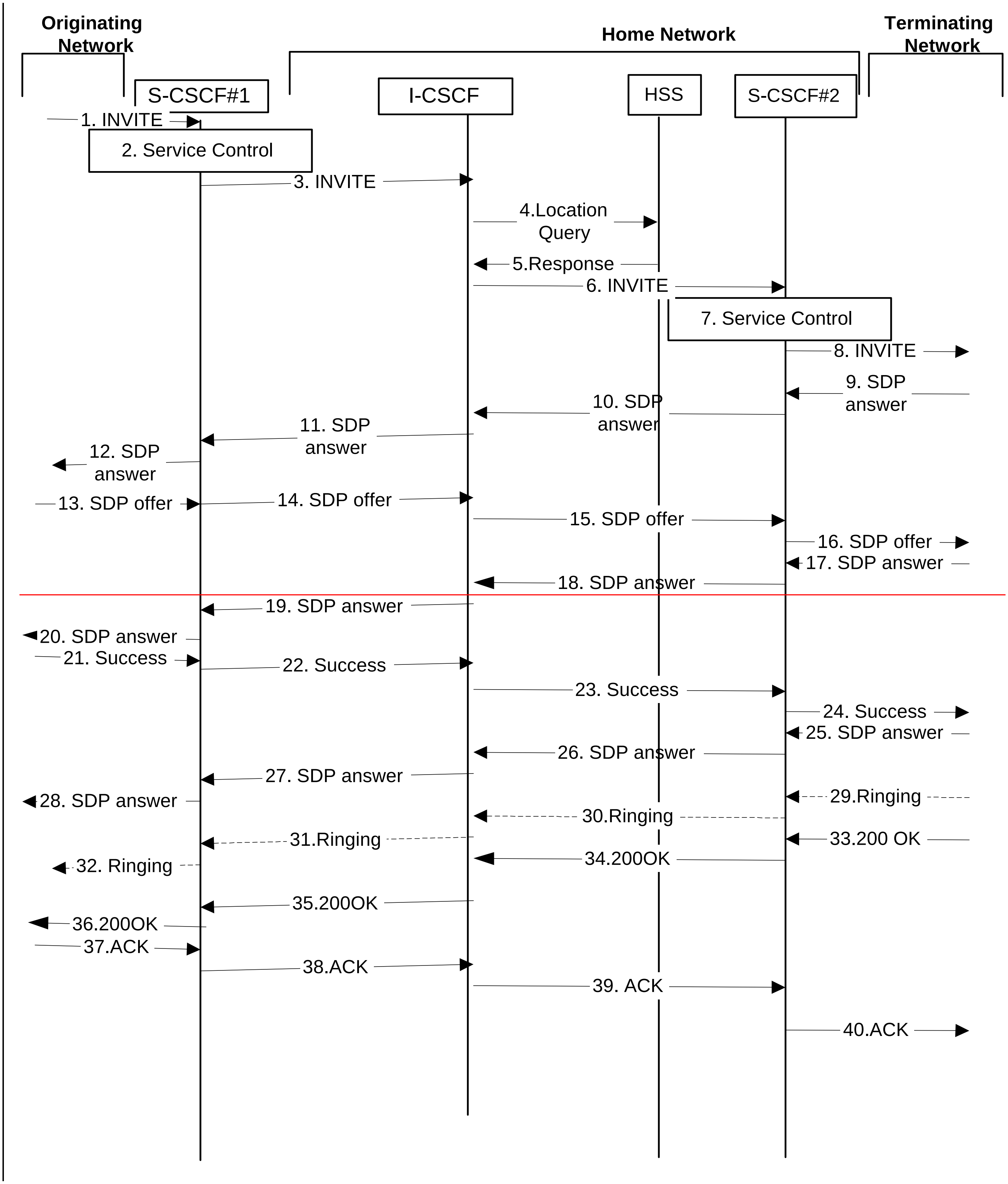
PSTN-O PSTN origination. The “Originating Network” of S-S#2 is the home network. The element labelled S-CSCF#1 is the MGCF of the PSTN-O procedure.

Termination sequences that share this common S-S procedure are:

MT#1 Mobile termination, roaming, . The “Terminating Network” of S-S#2 is a visited network.

MT#2 Mobile termination, home. The “Terminating Network” of S-S#2 is the home network.

MT#3 Mobile termination, CS Domain roaming. The “Terminating Network” of S-S#2 is a CS domain network.


Originating Network
Home Network
Terminating Network
S-CSCF#1
I-CSCF
HSS
S-CSCF#2
1. INVITE
2. Service Control
3. INVITE
4.Location Query
5.Response
6. INVITE
7. Service Control
8. INVITE
9. SDP answer
10. SDP answer
11. SDP answer
12. SDP answer
13. SDP offer
14. SDP offer
15. SDP offer
16. SDP offer
17. SDP answer
18. SDP answer
19. SDP answer
20. SDP answer
21. Success
22. Success
23. Success
24. Success
25. SDP answer
26. SDP answer
27. SDP answer
28. SDP answer
29.Ringing
30.Ringing
31.Ringing
32. Ringing
33.200 OK
34.200OK
35.200OK
36.200OK
37.ACK
38.ACK
39. ACK
40.ACK

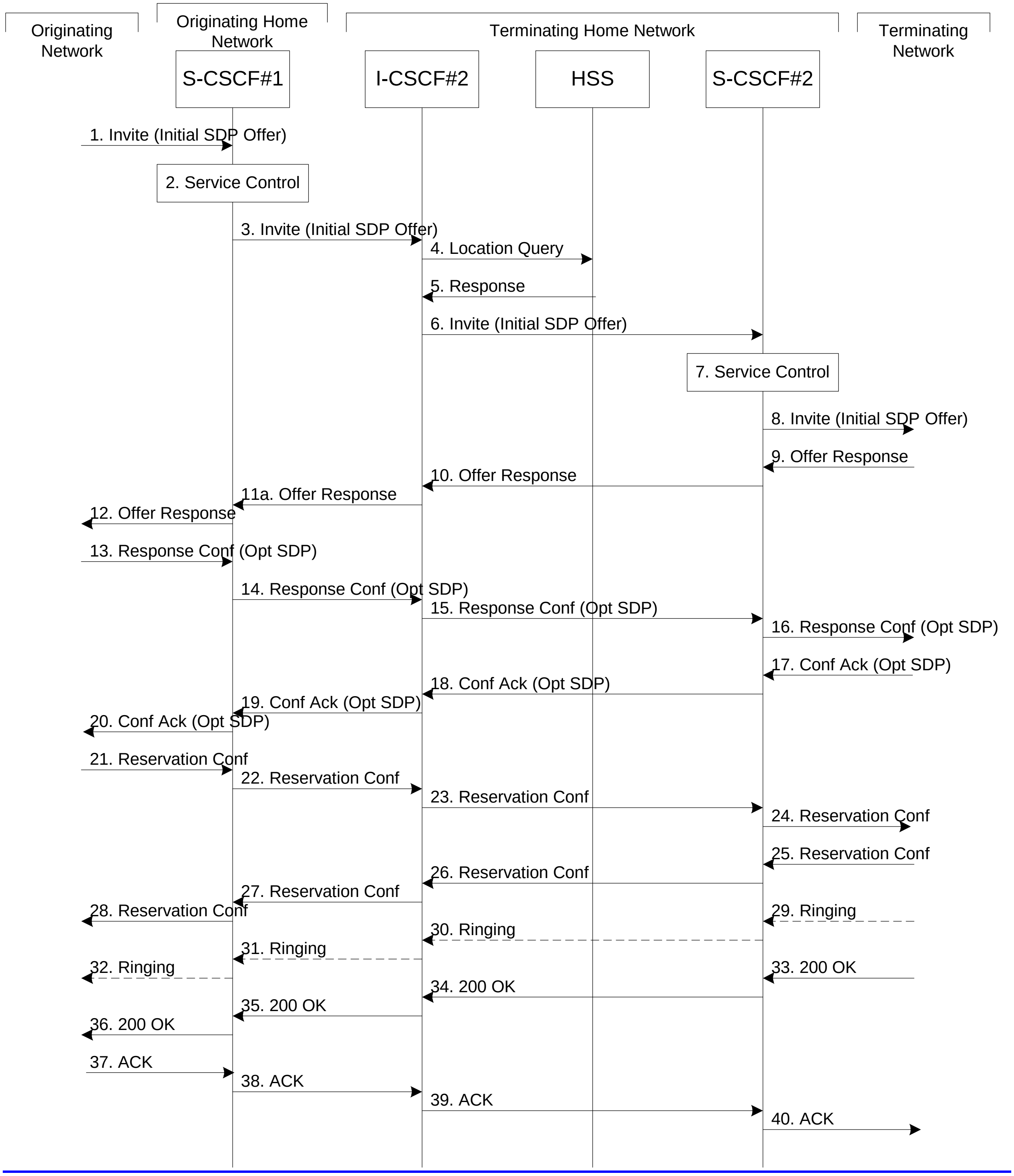


**Figure 5.11: Serving to serving procedure - same operator**

Procedure S-S#2 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow. This message should contain the initial media description offer in the SDP.
2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt

3. S-CSCF#1 performs an analysis of the destination address, and determines the network operator to whom the subscriber belongs. Since it is local, the request is passed to a local I-CSCF.

4. I-CSCF may query the HSS for current location information. If I-CSCF cannot determine, based on analysis of the destination number, that the HSS query will fail, then it will send "Cx-location-query" to the HSS to obtain the location information for the destination. If I-CSCF can determine, based on analysis of the destination number, that the HSS query will fail, it will not send the "Cx-location-query" message, allocate a MGCF for a PSTN termination, and continue with step #6.

5. HSS responds with the address of the current Serving-CSCF for the terminating subscriber.

6. I-CSCF forwards the INVITE request to the S-CSCF (S-CSCF#2) that will handle the session termination.

7. S-CSCF#2 performs whatever service control logic is appropriate for this session setup attempt

8. The sequence continues with the message flows determined by the termination procedure.

9-12. The terminating end point responds with an answer to the offered SDP and this message is passed along the established session path.

13-16. The originator decides on the offered set of media streams, confirms receipt of the Offer Response with a Response Confirmation, and forwards this information to S-CSCF#1 by the origination procedures. This message is forwarded via the established session path to the terminating end point. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 12 or a subset.

17-20. Terminating end point responds to the offered SDP and the response if forwarded to the originating end point via the established session path.

21-24. Originating end point sends successful resource reservation information towards the terminating end point via the established session path.

25-28. Terminating end point sends successful resource reservation acknowledgement towards the originating end point via the established session path

29-32. Terminating end point sends ringing message ~~to S-CSCF#2~~toward the originating end point via the established session path.

~~30.S-CSCF#2 forwards the ringing message to I-CSCF~~

~~31. I-CSCF forwards the ringing message to S-CSCF#1.~~

~~32. S-CSCF#1 forwards the ringing message to the originator, per the origination procedure~~

33-36. The SIP final response, 200-OK, is sent by the terminating endpoint over the signalling path. This is typically generated when the subscriber has accepted the incoming session setup attempt. The message is sent to S-CSCF#2 per the termination procedure.

~~34. S-CSCF#2 performs whatever service control logic is appropriate for this session setup completion~~

~~35. The 200-OK is passed to the I-CSCF~~

~~36. The 200-OK is passed to the S-CSCF#1~~

~~37. The 200-OK is passed to the Originating Network~~

~~38~~37-40. The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures and it is then sent over the signalling path to the terminating end point.

~~39. S-CSCF#1 forwards this message to S-CSCF#2.~~

~~40. S-CSCF#2 forwards this message to the terminating endpoint, as per the termination procedure~~

### 5.5.3 (S-S#3) Session origination with PSTN termination in the same network as the S-CSCF.

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines, with support of applications or other databases, that the session is destined to the PSTN. The request is therefore forwarded to a local BGCF. The BGCF determines that the MGCF should be in the same network, and selects a MGCF in that network. The request is then forwarded to the MGCF.

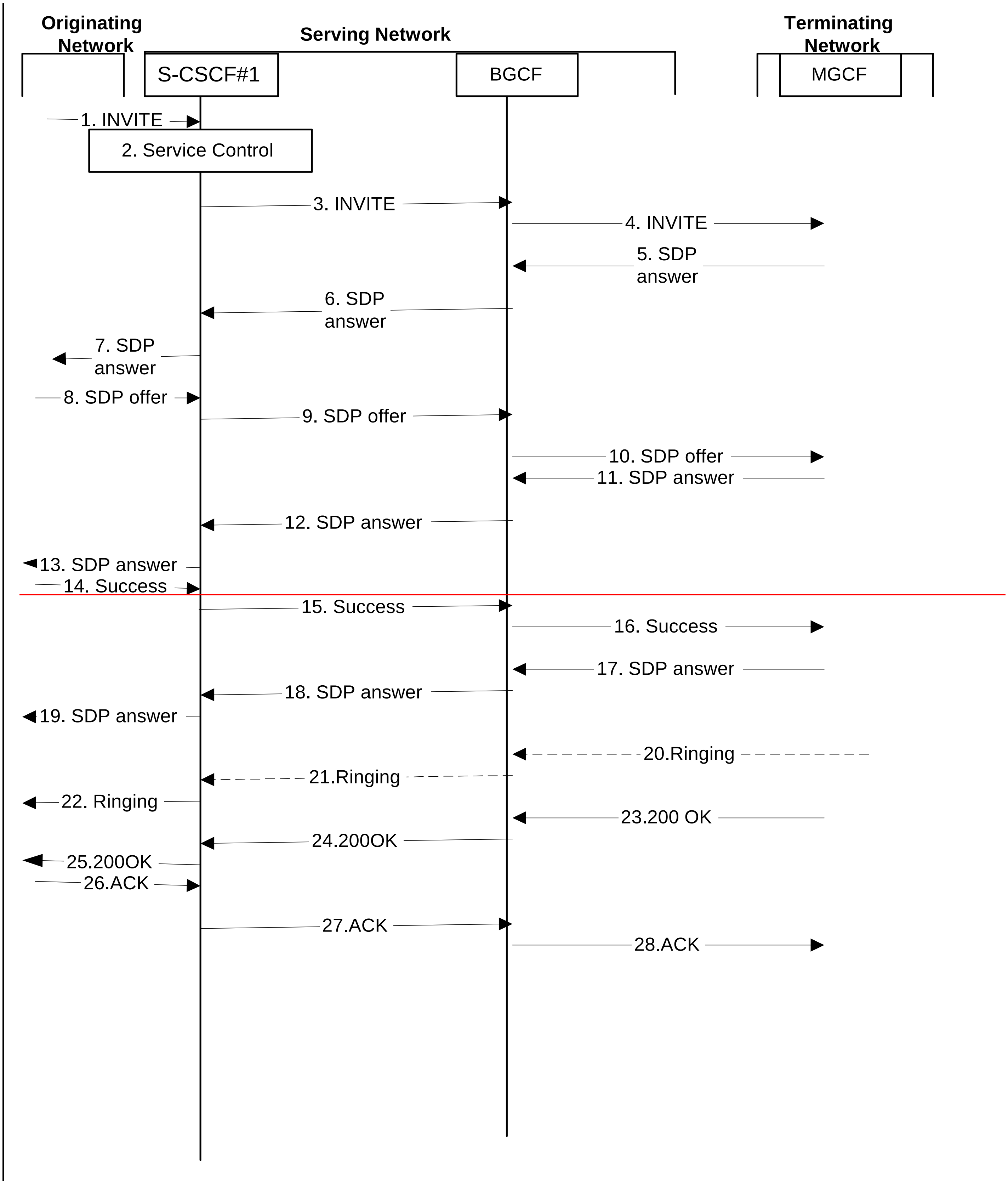
Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming. The “Originating Network” of S-S#3 is therefore a visited network.

MO#2 Mobile origination, located in home service area. The “Originating Network” of S-S#3 is therefore the home network.

Termination sequences that share this common S-S procedure are:

PSTN-T PSTN termination. This occurs when the MGCF is selected to be in the same network as the S-CSCF.


Originating Network
Serving Network
Terminating Network
S-CSCF#1
BGCF
MGCF
1. INVITE
2. Service Control
3. INVITE
4. INVITE
5. SDP answer
6. SDP answer
7. SDP answer
8. SDP offer
9. SDP offer
10. SDP offer
11. SDP answer
12. SDP answer
13. SDP answer
14. Success
15. Success
16. Success
17. SDP answer
18. SDP answer
19. SDP answer
20.Ringing
21.Ringing
22. Ringing
23.200 OK
24.200OK
25.200OK
26.ACK
27.ACK
28.ACK

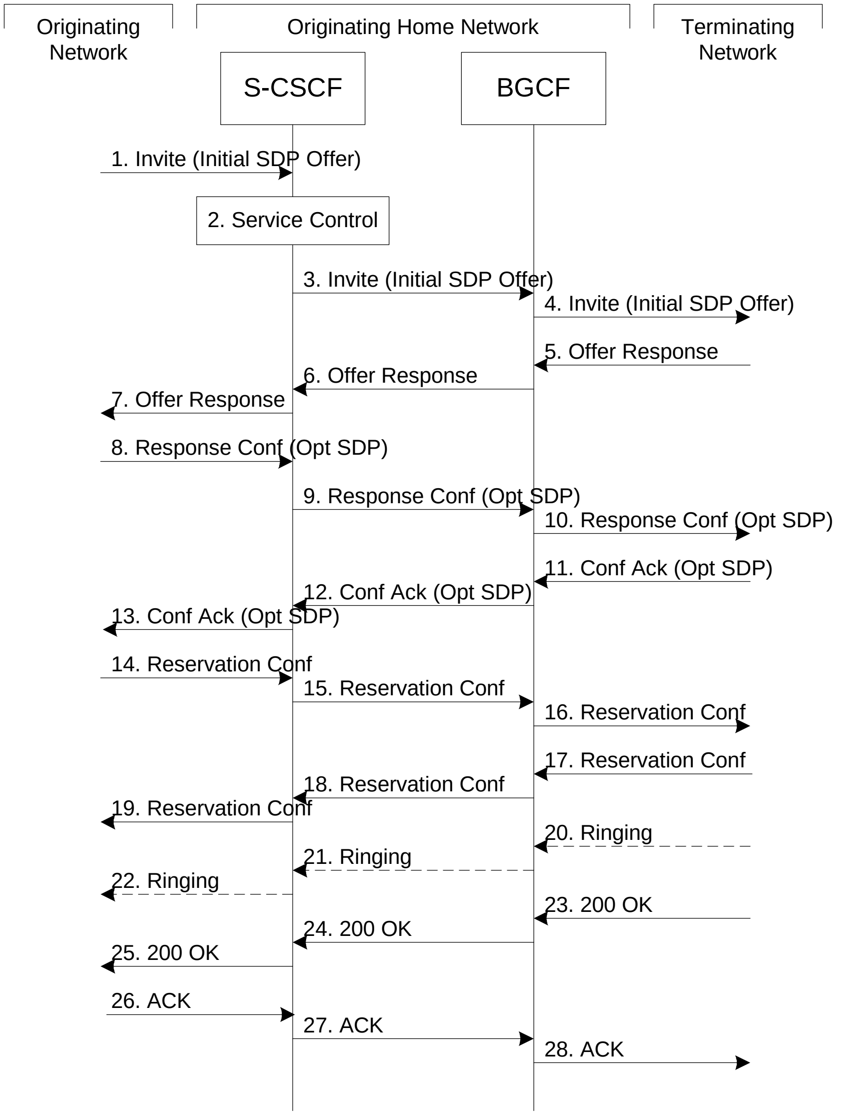


**Figure 5.12: Serving to PSTN procedure - same operator**

Procedure S-S#3 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow. This message should contain the initial media description offer in the SDP.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt

3. S-CSCF#1 performs an analysis of the destination address. From the analysis of the destination address, S-CSCF#1 determines that this is for the PSTN, and passes the request to the BGCF.

4. The BGCF determines that the MGCF shall be in the same network, and hence proceeds to select an appropriate MGCF. The SIP INVITE request is forwarded to the MGCF. The PSTN terminating information flows are then followed.

5-7. The media stream capabilities of the destination are returned along the signalling path ~~as SDP answer~~, as per the PSTN termination procedure.

8. The originator decides the offered set of media streams, confirms receipt of the Offer Response with a Response Confirmation, and forwards this information to S-CSCF#1 by the origination procedures. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 7 or a subset.

9-10. S-CSCF#1 forwards the offered SDP to the terminating endpoint as per the PSTN terminating procedures via the established session path.

11-13. The terminating end point answers to the offered SDP and the message is passed through the established session path to the originating end point.

14-16. When the originating endpoint has completed the resource reservation procedures, it sends the successful resource reservation message to S-CSCF#1 by the origination procedures and it is passed to the terminating end point through the session path.

17-19. . The terminating endpoint acknowledges the result and the message is passed onto the originating end point via the session path.

20-~~21~~22. Terminating end point generates ringing message and forwards it to BGCF which in tern forwards the message to SCSCF#1. ~~–~~ S-CSCF#1 forwards the ringing message to the originator, per the origination procedure

~~22.S-CSCF#1 forwards the ringing message to the originator, per the origination procedure~~

23. When the destination party answers, the termination procedure results in a SIP 200-OK final response to the BGCF

24-25. The BGCF forwards this information to the S-CSCF#1 and then it is forwarded to the originating end point.

26. The 200-OK is returned to the originating endpoint, by the origination procedure from terminating end point.

27. The originating endpoint sends the final acknowledgement to S-CSCF#1 by the origination procedures.

28. S-CSCF#1 forwards this message to the terminating endpoint as per the PSTN terminating procedures.

### 5.5.4 (S-S#4) Session origination with PSTN termination in a different network from the S-CSCF.

The Serving-CSCF handling session origination performs an analysis of the destination address, and determines, with support of applications or other databases, that the session is destined to the PSTN. The request is therefore forwarded to a local BGCF. The BGCF determines that the PSTN interworking should occur in another network, and forwards this to a BGCF in the interworking network. The BGCF then selects a MGCF in that network. The request is then forwarded to the MGCF.

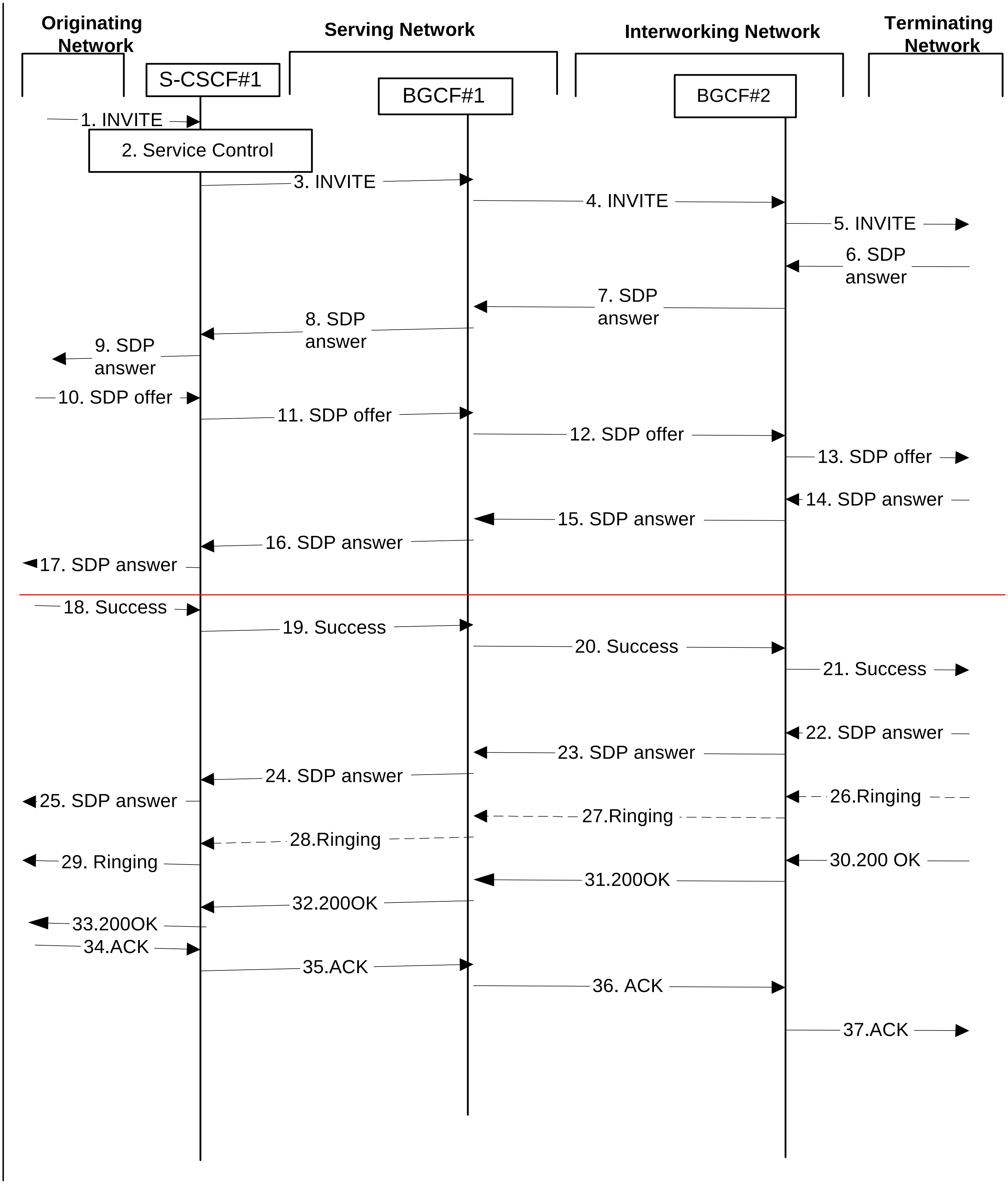
Origination sequences that share this common S-S procedure are:

MO#1 Mobile origination, roaming. The “Originating Network” of S-S#4 is therefore a visited network.

MO#2 Mobile origination, located in home service area. The “Originating Network” of S-S#4 is therefore the home network.

Termination sequences that share this common S-S procedure are:

PSTN-T PSTN termination. This occurs when the MGCF is selected to be in the same network as the S-CSCF.


Originating Network
Serving Network
Interworking Network
Terminating Network
S-CSCF#1
BGCF#1
BGCF#2
1. INVITE
2. Service Control
3. INVITE
4. INVITE
5. INVITE
6. SDP answer
7. SDP answer
8. SDP answer
9. SDP answer
10. SDP offer
11. SDP offer
12. SDP offer
13. SDP offer
14. SDP answer
15. SDP answer
16. SDP answer
17. SDP answer
18. Success
19. Success
20. Success
21. Success
22. SDP answer
23. SDP answer
24. SDP answer
25. SDP answer
26.Ringing
27.Ringing
28.Ringing
29. Ringing
30.200 OK
31.200OK
32.200OK
33.200OK
34.ACK
35.ACK
36. ACK
37.ACK

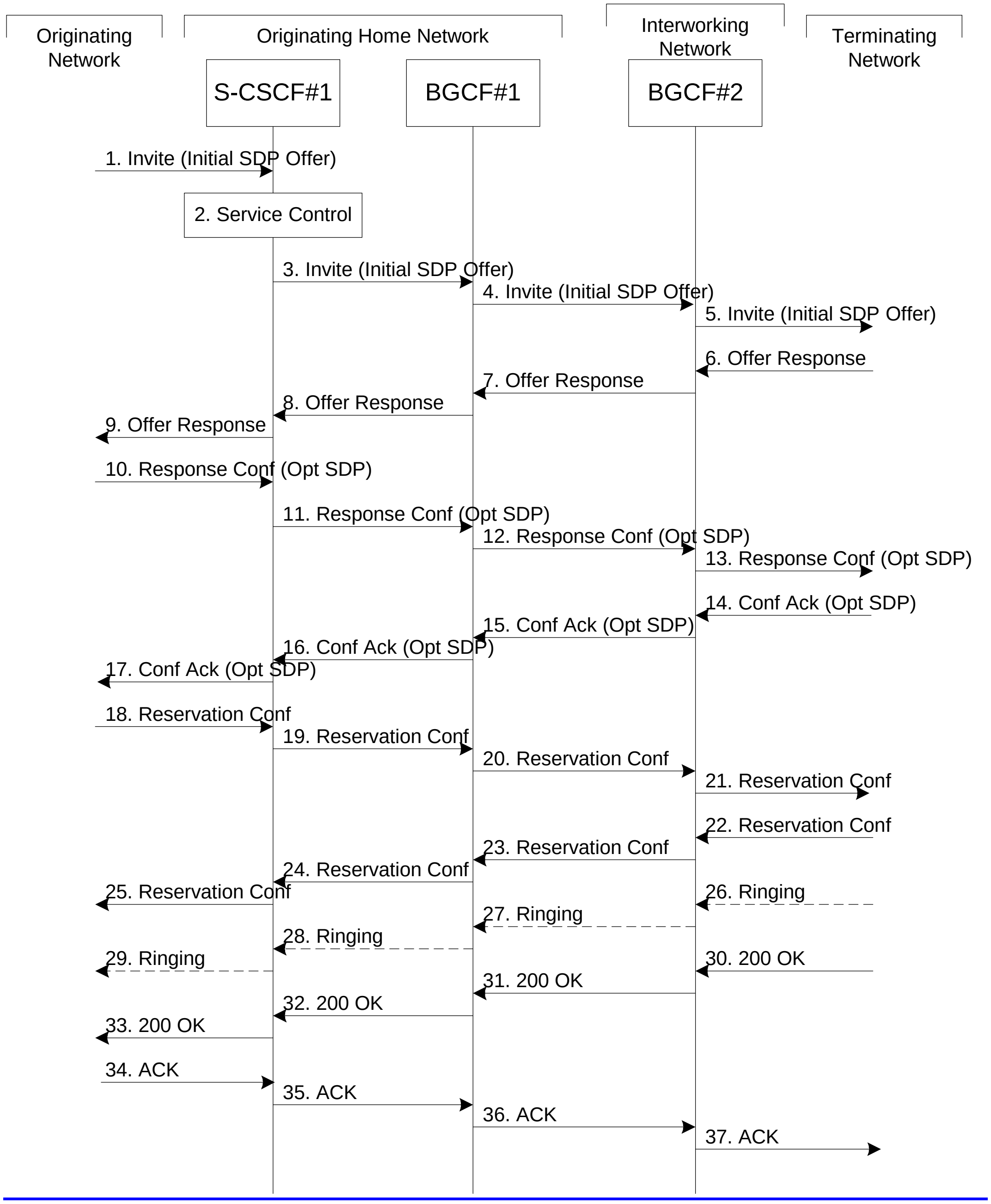


**Figure 5.13: Serving to PSTN procedure - different operator**

Procedure S-S#4 is as follows:

1. The SIP INVITE request is sent from the UE to S-CSCF#1 by the procedures of the originating flow. This message should contain the initial media description offer in the SDP.

2. S-CSCF#1 performs whatever service control logic is appropriate for this session setup attempt

3. S-CSCF#1 performs an analysis of the destination address. From the analysis of the destination address, S-CSCF#1 determines that this is for the PSTN, and passes the request to the BGCF#1.

4. The BGCF#1 determines that the PSTN interworking should occur in interworking network, and forwards the request on to BGCF#2. For the case that network hiding is required, the request is forwarded through an I-CSCF(THIG).

5. BGCF#2 determines that the MGCF shall be in the same network, and hence proceeds to select an appropriate MGCF. The SIP INVITE request is forwarded to the MGCF. The PSTN terminating information flows are then followed.

6-8. The media stream capabilities of the destination are returned along the signalling path, as per the PSTN termination procedure.

~~7. BGCF#2 forwards the SDP to BGCF#1~~

~~8. BGCF#1 forwards the SDP to S-CSCF#1.~~

9. S-CSCF#1 forwards the SDP to the originator, as per the originating procedure.

10. The originator decides the offered set of media streams, confirms receipt of the Offer Response with a Response Confirmation, and forwards this information to S-CSCF#1 by the origination procedures. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 12 or a subset.

11-13. S-CSCF#1 forwards the offered SDP to the terminating endpoint, as per the PSTN terminating procedure.

14-17. Terminating end point responds to the offer via the established session path towards the originating end point.

18-21.When the originating endpoint has completed the resource reservation procedures, it sends the successful resource reservation message to S-CSCF#1 by the origination procedures and it is forwarded to the terminating end point via established session path.

22-25. The terminating end point responds to the message towards the originating end point.

26-29. Terminating end point generates ringing message towards the originating end point.

30-33. Terminating end point sends 200 OK when the originating end answers the session.

34-37. Originating end point acknowledges the establishment of the session.

## 5.6 Origination procedures

This section presents the detailed application level flows to define the Procedures for session originations.

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

A UE always has a proxy (P-CSCF) associated with it. This P-CSCF is located in the same network as the GGSN, performs resource authorisation, and may have additional functions in handling of emergency sessions. The P-CSCF is determined by the CSCF discovery process, described in Section 5.1.1 (Local CSCF Discovery).

As a result of the registration procedure, the P-CSCF determines the next hop toward the Serving-CSCF. This next hop is to the S-CSCF in the home network (possibly through an I-CSCF(THIG) to hide the network configuration) (MO#1). These next-hop addresses could be IPv6 addresses, or could be names that are translated via DNS to an IPv6 address.

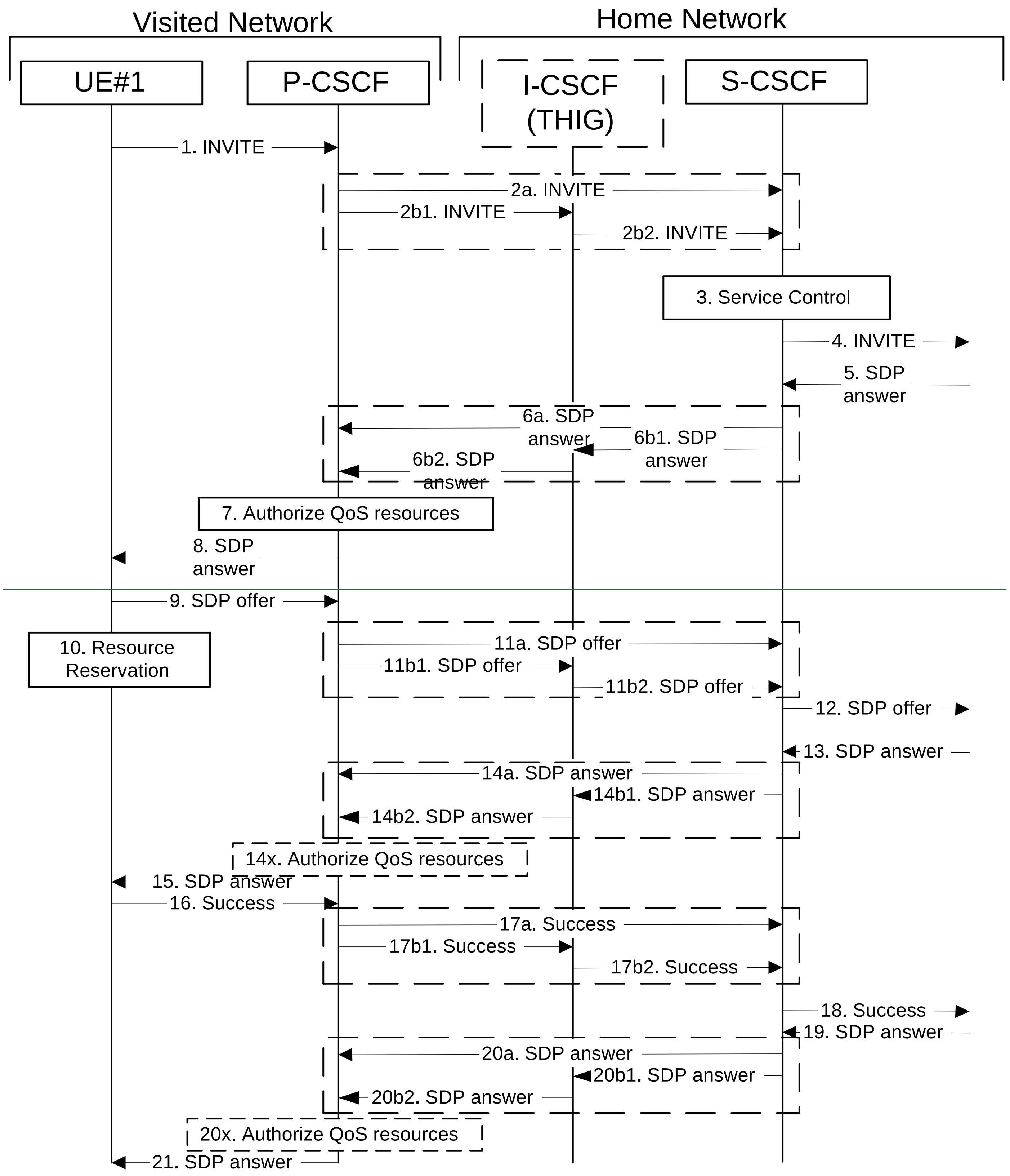
Sessions originated in the PSTN to a mobile destination are a special case of the Origination procedures. The MGCF uses H.248 [19] to control a Media Gateway, and communicates with the SS7 network. The MGCF initiates the SIP request, and subsequent nodes consider the signalling as if it came from a S-CSCF.

### 5.6.1 (MO#1) Mobile origination, roaming

This origination procedure applies to roaming subscribers. .

The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure described in section 5.1.1. The home network advertises either the S-CSCF or an I-CSCF as the entry point from the visited network.

When registration is complete, P-CSCF knows the name/address of the next hop in the signalling path toward the serving-CSCF, either I-CSCF(THIG) (if the home network wanted to hide their internal configuration) or S-CSCF (if there was no desire to hide the network configuration). I-CSCF, if it exists in the signalling path, knows the name/address of S-CSCF.


Visited Network
Home Network
UE#1
P-CSCF
I-CSCF (THIG)
S-CSCF
1. INVITE
2a. INVITE
2b1. INVITE
2b2. INVITE
3. Service Control
4. INVITE
5. SDP answer
6a. SDP answer
6b1. SDP answer
6b2. SDP answer
7. Authorize QoS resources
8. SDP answer
9. SDP offer
10. Resource Reservation
11a. SDP offer
11b1. SDP offer
11b2. SDP offer
12. SDP offer
13. SDP answer
14a. SDP answer
14b1. SDP answer
14b2. SDP answer
14x. Authorize QoS resources
15. SDP answer
16. Success
17a. Success
17b1. Success
17b2. Success
18. Success
19. SDP answer
20a. SDP answer
20b1. SDP answer
20b2. SDP answer
20x. Authorize QoS resources
21. SDP answer

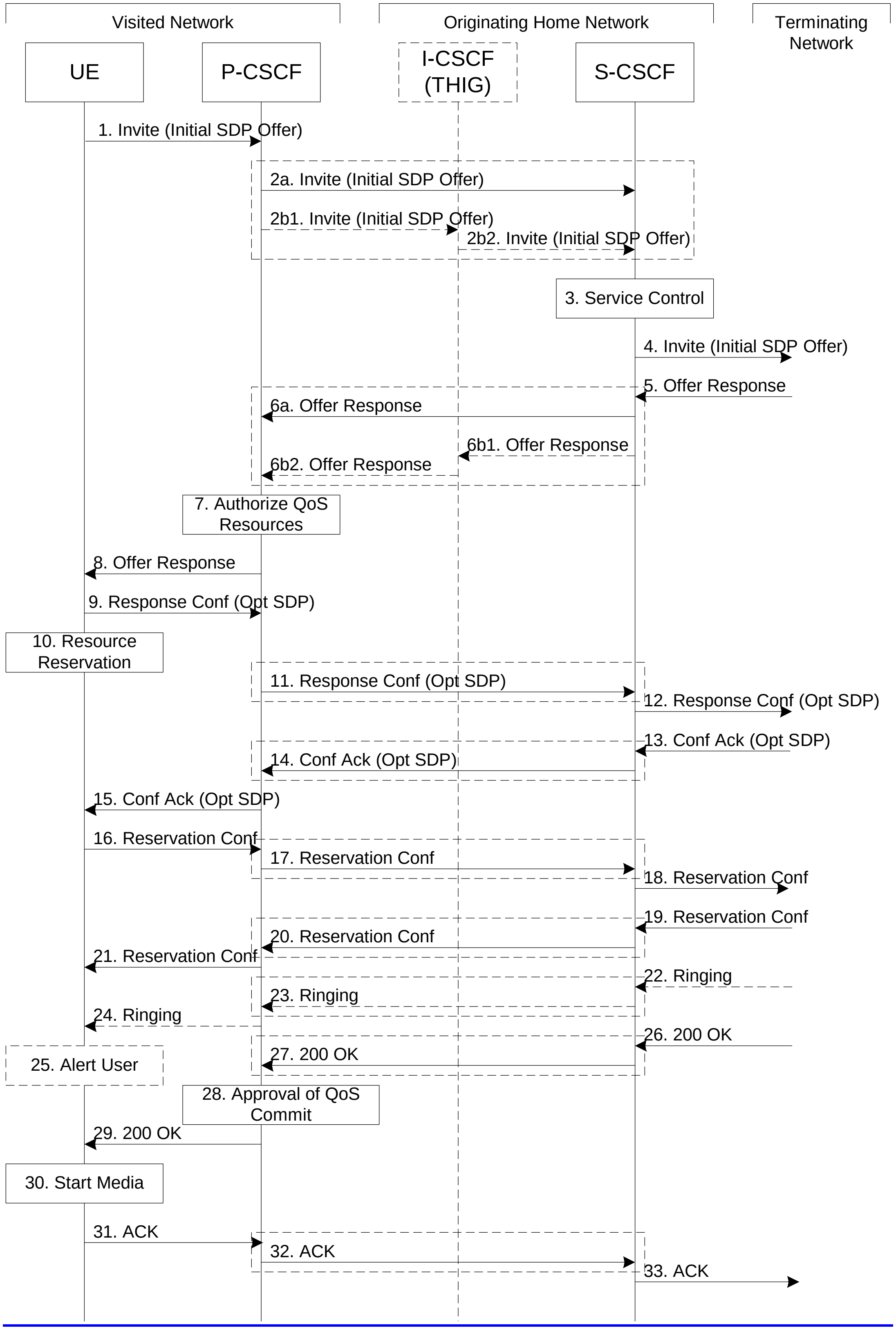


**Figure 5.14~~-1~~: Mobile origination procedure - roaming~~ (part 1)~~**

~~Error! Objects cannot be created from editing field codes. **Figure 5.14-2: Mobile origination procedure – roaming (part 2)**~~

Procedure MO#1 is as follows:

1. UE sends the SIP 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 multi-media session.

2. P-CSCF remembers (from the registration procedure) the next hop CSCF for this UE.

   This next hop is either the S-CSCF that is serving the visiting UE (choice (a)), or an I-CSCF(THIG) within the home network that is performing the configuration hiding function for the home network operator (choice (b)).

   (2a) If the home network operator does not desire to keep their network configuration hidden, the name/address of the S-CSCF was provided during registration, and the INVITE request is forwarded directly to the S-CSCF.

   (2b) If the home network operator desires to keep their network configuration hidden, the name/address of an I-CSCF(THIG) in the home network was provided during registration, and the INVITE request is forwarded through this I-CSCF(THIG) to the S-CSCF.

   (2b1) P-CSCF forwards the INVITE request to I-CSCF(THIG)

   (2b2) I-CSCF(THIG) forwards the INVITE request to S-CSCF

3. S-CSCF validates the service profile, and performs any origination service control required for this subscriber. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

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

5. The media stream capabilities of the destination are returned along the signalling path, per the S-S procedures.

6. S-CSCF forwards the ~~SDP~~ Offer Response message to P-CSCF. Based on the choice made in step #2 above, this may be sent directly to P-CSCF (6a) or may be sent through I-CSCF(THIG)~~(firewall)~~ (6b1 and 6b2).

7. P-CSCF authorises the resources necessary for this session. The Authorization-Token is generated by the PCF.

8. The Authorization-Token is included in the Offer Response~~SDP~~ message. P-CSCF forwards the ~~SDP~~ message to the originating endpoint

9. UE decides the offered set of media streams for this session, confirms receipt of the Offer Response and sends the ~~offered SDP to~~Response Confirmation to the P-CSCF. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 8 or a subset. If new media are defined by this SDP, a new authorization (as in Step 7) will be done by the P-CSCF(PCF) following Step 14. The originating UE is free to continue to offer new media on this operation or on subsequent exchanges using the Update method. Each offer/answer exchange will cause the P-CSCF(PCF) to repeat the Authorization step (Step 7) again.

10. After determining the needed resources in step 8, UE initiates the reservation procedures for the resources needed for this session.

~~-~~11. ~~After determining the needed resources in step 8, UE initiates the reservation procedures for the resources needed for this session.~~ P-CSCF forwards the ~~offered  SDP~~Response Confirmation to S-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF. Step 11 may be similar to Step 2 depending on whether or not configuration hiding is used.

12. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

13-~~14x~~15. The terminating end point responds to the originating end with an acknowledgement. If Optional SDP is contained in the Response Confirmation, the Confirmation Acknowledge will also contain an SDP response. ~~to the offered SDP with an answer and~~If the SDP has changed, the P-CSCF validates that the resources are allowed to be used. Step 14 may be similar to Step 6 depending on whether or not configuration hiding is used.

~~15. The answered SDP is forwarded to the UE.~~

16-18. When the resource reservation is completed, UE sends the successful Resource Reservation message to the terminating endpoint, via the signalling path established by the INVITE message. The message is sent first to P-CSCF. Step 17 may be similar to Step 2 depending on whether or not configuration hiding is used.

~~17. P-CSCF forwards this message to S-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.~~

~~18. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.~~

19-21~~0x~~. The terminating end point responds to the originating end when successful resource reservation has occured. If the SDP has changed, the P-CSCF authorizes that the resources are allowed to be used. Step 20 may be similar to Step 6 depending on whether or not configuration hiding is used.~~The terminating end point responds to the offered SDP with an answer and P-CSCF validates that the resources are allowed to be used.~~

~~21. P-CSCF forwards this message to the UE.~~

22-24. Terminating end point may generate ringing and it is then forwarded via the session path to the UE.

25. UE indicates to the originating subscriber that the destination is ringing

26. When the destination party answers, the terminating endpoint sends a SIP 200-OK final response, as specified by the termination procedures and the S-S procedures, to S-CSCF.

27. S-CSCF performs whatever service control is appropriate for the completed session setup.

27. S-CSCF sends a SIP 200-OK final response along the signalling path back to P-CSCF. ~~Based on the choice made in (2) above, this response may either be sent directly from S-CSCF to P-CSCF (choice (a)), or be sent indirectly through I-CSCF(THIG) (choice (b)).~~ Step 23 may be similar to Step 6 depending on whether or not configuration hiding is used.

28. P-CSCF indicates the resources reserved for this session should now be approved for use.

29. P-CSCF sends a SIP 200-OK final response to the session originator

30. UE starts the media flow(s) for this session

31-33. UE responds to the 200 OK with a SIP ACK message sent along the signalling path. ~~, which is sent to P-CSCF.~~ Step 32 may be similar to Step 2 depending on whether or not configuration hiding is used.

~~32. P-CSCF forwards the final ACK message to S-CSCF. This may possible be routed through the I-CSCF depending on operator configuration of the I-CSCF.~~

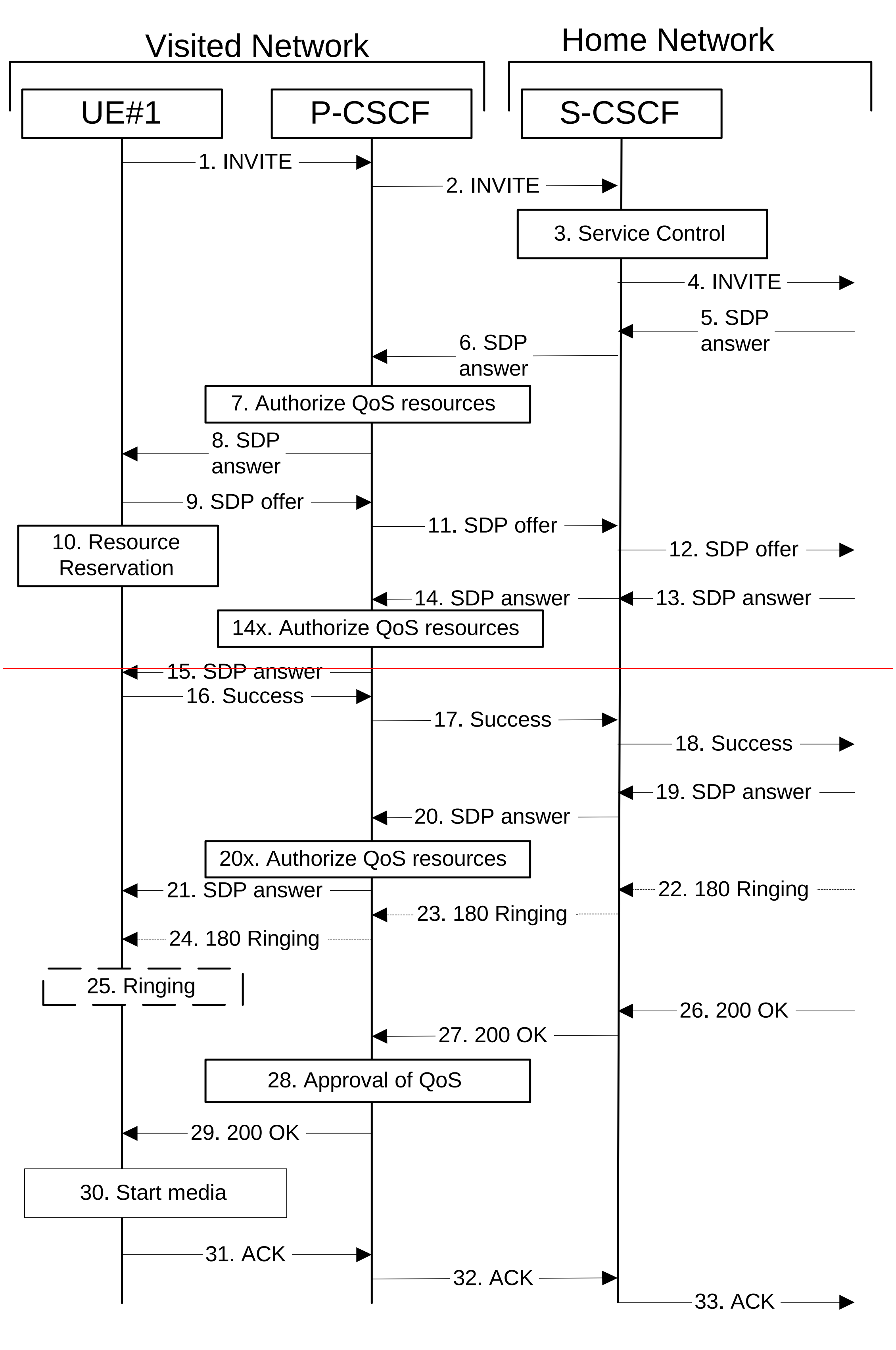
~~33. S-CSCF forwards the final ACK message to the terminating endpoint, per the S-S procedure.~~

### 5.6.2 (MO#2) Mobile origination, home

This origination procedure 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 described in section 5.1.1. During registration, the home network allocates an S-CSCF in the home network.

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


Visited Network
Home Network
UE#1
P-CSCF
S-CSCF
1. INVITE
2. INVITE
3. Service Control
4. INVITE
5. SDP answer
6. SDP answer
7. Authorize QoS resources
8. SDP answer
9. SDP offer
10. Resource Reservation
11. SDP offer
12. SDP offer
13. SDP answer
14. SDP answer
14x. Authorize QoS resources
~~15. SDP answer~~
16. Success
17. Success
18. Success
19. SDP answer
20. SDP answer
20x. Authorize QoS resources
21. SDP answer
22. 180 Ringing
23. 180 Ringing
24. 180 Ringing
25. Ringing
26. 200 OK
27. 200 OK
28. Approval of QoS
29. 200 OK
30. Start media
31. ACK
32. ACK
33. ACK

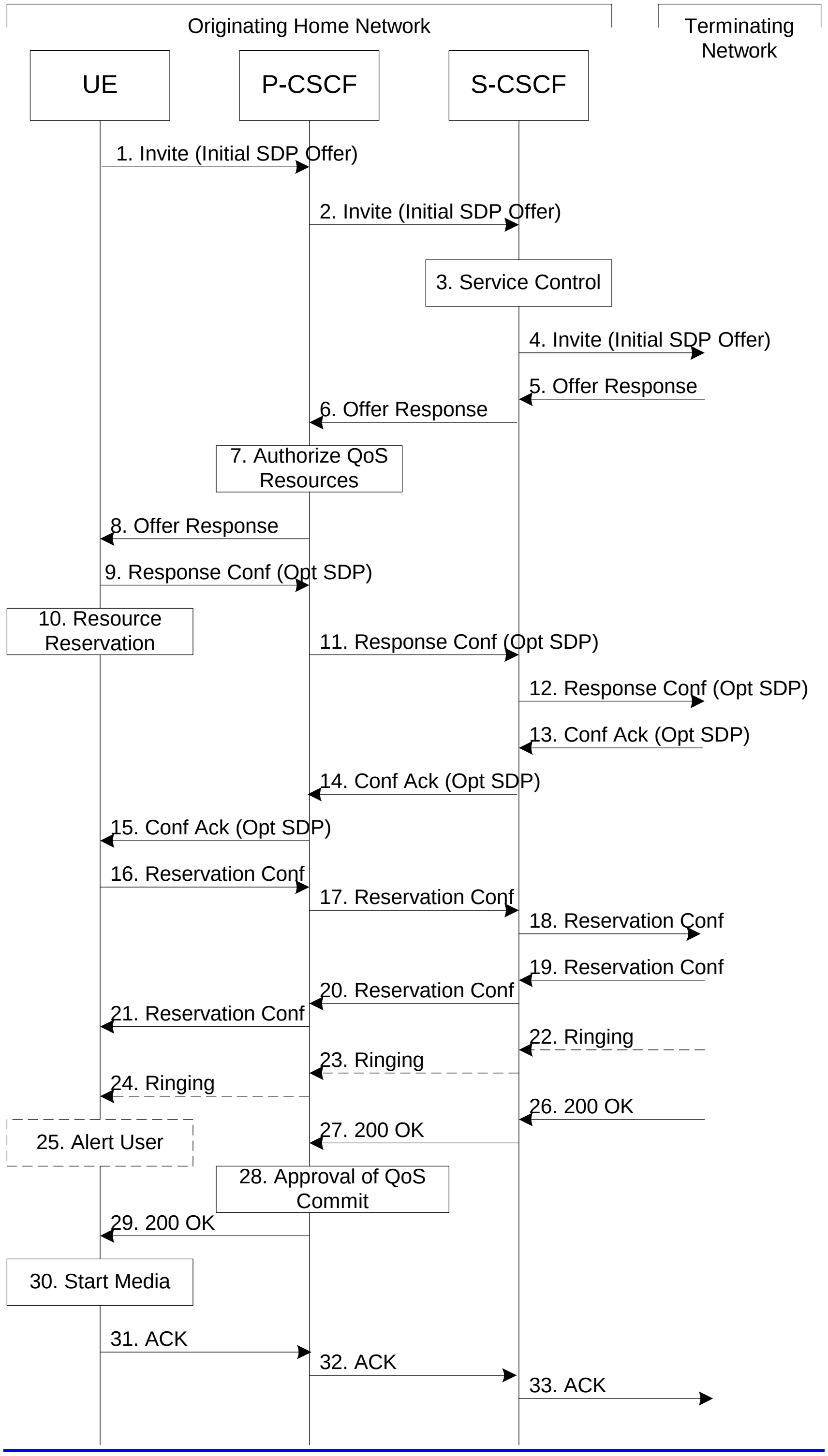


**Figure 5.15: Mobile origination procedure - home**

Procedure MO#2 is as follows:

1. UE#1 sends the SIP 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 multi-media session.

2. P-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. In this case it forwards the INVITE to the S-CSCF in the home network.

3. S-CSCF validates the service profile, and performs any origination service control required for this subscriber. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

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

5. The media stream capabilities of the destination are returned along the signalling path, per the S-S procedures.

6. S-CSCF forwards the ~~SDP~~ Offer Response message to P-CSCF

7. P-CSCF authorises the resources necessary for this session. The Authorization-Token is generated by the PCF.

8. The Authorization-Token is included in the Offer Response~~SDP~~ message. P-CSCF forwards the ~~SDP~~ message to the originating endpoint.

9. UE decides the offered set of media streams for this session, confirms receipt of the Offer Response and sends the ~~offered SDP~~Response Confirmation to P-CSCF. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response received in Step 8 or a subset. If new media are defined by this SDP, a new authorization (as in Step 7) will be done by the P-CSCF(PCF) following Step 14. The originating UE is free to continue to offer new media on this operation or on subsequent exchanges using the Update method. Each offer/answer exchange will cause the P-CSCF(PCF) to repeat the Authorization step (Step 7) again.

10. UE initiates resource reservation for the offered media.

11. P-CSCF forwards this message to S-CSCF

12. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.

13-14~~x~~. The terminating end point responds to the originating end with an acknowledgement. If Optional SDP is contained in the Response Confirmation, the Confirmation Acknowledge will also contain an SDP response. ~~answers to the offered media and~~ If the SDP has changed, the PCSCF authorises the media.

15. PCSCF forwards the answered media towards the UE.

16-18. When the resource reservation is completed, UE sends the successful Resource Reservation message to the terminating endpoint, via the signalling path established by the INVITE message. The message is sent first to P-CSCF.

~~17. P-CSCF forwards this message to S-CSCF.~~

~~18. S-CSCF forwards this message to the terminating endpoint, as per the S-S procedure.~~

19-2~~0~~1~~x~~. The terminating end point responds to the originating end when successful resource reservation has occured. If the SDP has changed, the P-CSCF again authorizes that the resources are allowed to be used. ~~The terminating end point answers to the offered media and PCSCF authorises the media.~~

~~21. PCSCF forwards the answered media to the UE.~~

22-24. The destination UE may optionally perform alerting. If so, it signals this to the originating party by a provisional response indicating Ringing. This message is sent to S-CSCF per the S-S procedure. It is sent from there toward the originating end along the signalling path.

~~23. S-CSCF forwards this message to P-CSCF.~~

~~24. P-CSCF forwards the ringing message to UE.~~

25. UE indicates to the originating subscriber that the destination is ringing.

26-27. When the destination party answers, the terminating endpoint sends a SIP 200-OK final response along the signalling path to the originating end, as specified by the termination procedures and the S-S procedures, to S-CSCF.

~~27. S-CSCF passes the 200-OK response back to P-CSCF, following the path of the INVITE request of step (2) above.~~

28. P-CSCF indicates the resources reserved for this session should now be approved for use.

29. P-CSCF passes the 200-OK response back to UE

30. UE starts the media flow(s) for this session.

31-33. UE responds to the 200 OK with an ACK message which is sent to P-CSCF and passed along the signalling path to the terminating end.

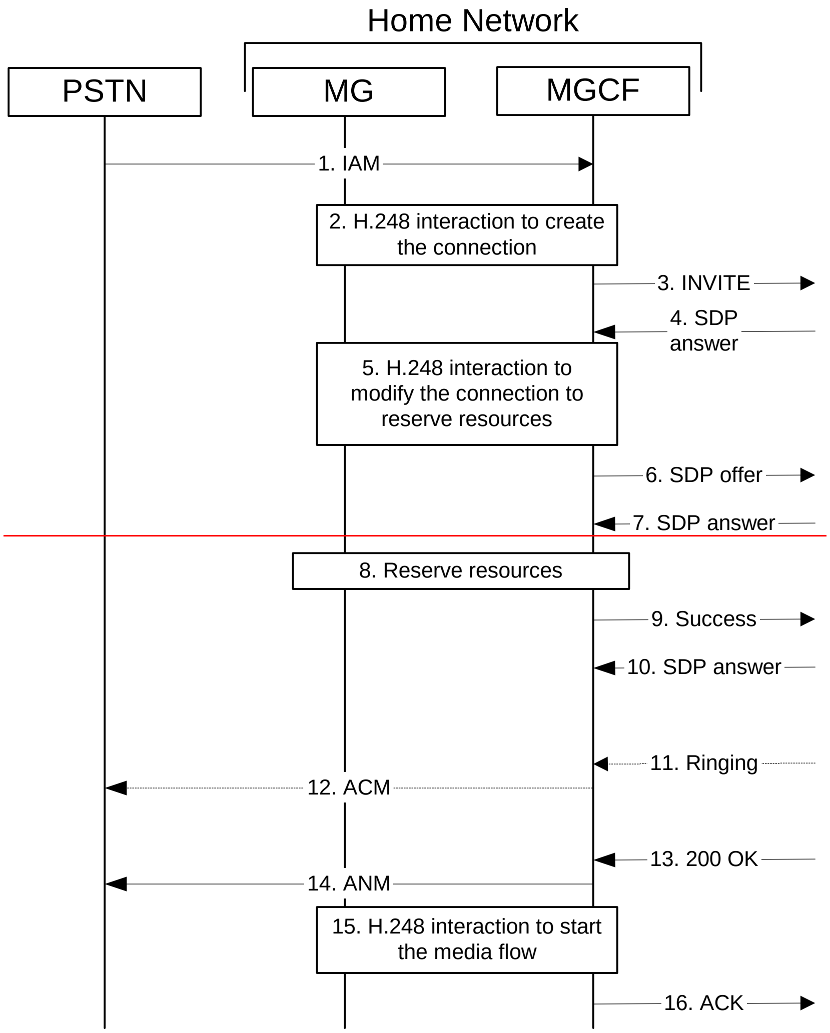
~~32. P-CSCF forwards the final ACK message to S-CSCF.~~

~~33. S-CSCF forwards the final ACK message to the terminating endpoint, per the S-S procedure.~~

### 5.6.3 (PSTN-O) PSTN origination

The MGCF in the IM CN subsystem is a SIP endpoint that initiates requests on behalf of the PSTN and Media Gateway. The subsequent nodes consider the signalling as if it came from a S-CSCF. The MGCF incorporates the network security functionality of the S-CSCF. This MGCF does not invoke Service Control, as this may be carried out in the GSTN or at the terminating S-CSCF. This origination procedure can be used for any of the S-S procedures.

Due to routing of sessions within the PSTN, this origination procedure will only occur in the home network of the destination subscriber. However due to cases of session forwarding and electronic surveillance, the destination of the session through the IM CN subsystem may actually be another PSTN termination.


Home Network
PSTN
MG
MGCF
1. IAM
2. H.248 interaction to create the connection
3. INVITE
4. SDP answer
5. H.248 interaction to modify the connection to reserve resources
6. SDP offer
7. SDP answer
8. Reserve resources
9. Success
10. SDP answer
11. Ringing
12. ACM
13. 200 OK
14. ANM
15. H.248 interaction to start the media flow
16. ACK

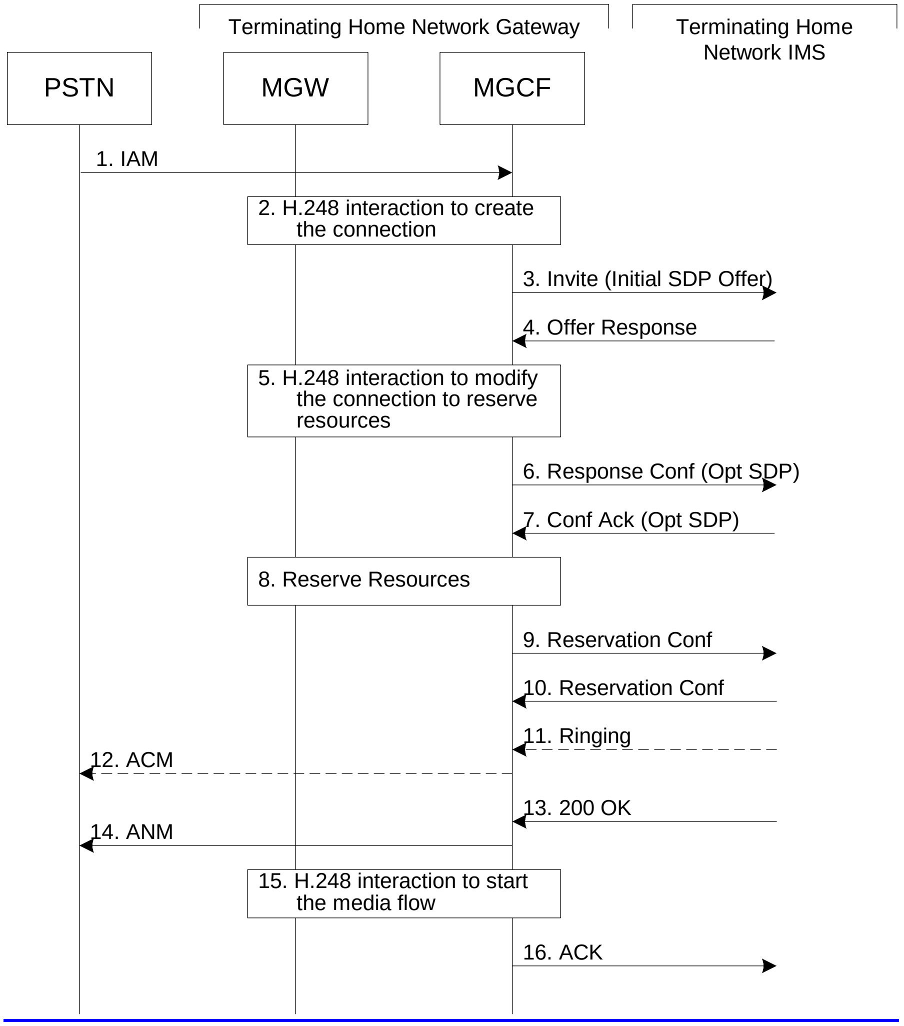

Terminating Home Network Gateway
Terminating Home Network IMS
PSTN
MGW
MGCF
1. IAM
2. H.248 interaction to create the connection
3. Invite (Initial SDP Offer)
4. Offer Response
5. H.248 interaction to modify the connection to reserve resources
6. Response Conf (Opt SDP)
7. Conf Ack (Opt SDP)
8. Reserve Resources
9. Reservation Conf
10. Reservation Conf
11. Ringing
12. ACM
13. 200 OK
14. ANM
15. H.248 interaction to start the media flow
16. ACK

**Figure 5.16: PSTN origination procedure**

The PSTN Origination procedure is as follows:

1. The PSTN establishes a bearer path to the MGW, and signals to the MGCF with a IAM message, giving the trunk identity and destination information

2. The MGCF initiates a H.248 command, to seize the trunk and an IP port.

3. The MGCF initiates a SIP INVITE request, containing an initial SDP, as per the proper S-S procedure.

4. The media stream capabilities of the destination are returned along the signalling path, per the S-S procedures.

5. MGCF initiates a H.248 command to modify the connection parameters and instruct the MGW to reserve the resources needed for the session.

6. MGCF decides the offered set of media streams for this session, confirms receipt of the Offer Response and sends the ~~offered SDP~~Response Confirmation per the S-S procedures.

7. Terminating end point responds to the ~~offered media~~Response Confirmation. If Optional SDP is contained in the Response Confirmation, the Confirmation Acknowledge will also contain an SDP response.

8. MGW reserves the resources needed for the session

9. When the resource reservation is completed, MGCF sends the successful Resource Reservation  message to the terminating endpoint, per the S-S procedures.

10. Terminating end point responds to the successful media resource reservation.

11. The destination endpoint may optionally perform alerting. If so, it signals this to the originating party by a provisional response indicating Ringing. This message is sent to MGCF per the S-S procedure.

12. If alerting is being performed, the MGCF forwards an ACM message to PSTN

13. When the destination party answers, the terminating and S-S procedures result in a SIP 200-OK final response being sent to MGCF

14. MGCF forwards an ANM message to to the PSTN

15. MGCF initiates a H.248 command to alter the connection at MGW to make it bi-6directional

16. MGCF acknowledges the SIP final response with a SIP ACK message

## 5.7 Termination procedures

This section presents the detailed application level flows to define the Procedures for session terminations.

The session termination procedures specify the signalling path between the Serving-CSCF assigned to perform the session termination service and the UE. This signalling path is determined at the time of UE registration, and remains fixed for the life of the registration. This signalling path is the reverse of the session initiation signalling path of Section 5.6. Therefore there is a one-to-one correspondence between the origination procedures of section 5.6 and the termination procedures of this section.

A UE always has a proxy (P-CSCF) associated with it. This P-CSCF is located in the same network as the GGSN, and performs resource authorisation for the sessions to the UE. The P-CSCF is determined by the CSCF discovery process, described in Section 5.1.1 (Local CSCF Discovery).

As a result of the registration procedure, the P-CSCF knows the address of the UE. The assigned S-CSCF, knows the name/address of the P-CSCF (procedure MT#3, and MT#4, depending on the location of S-CSCF and P-CSCF). If the network operator owning the S-CSCF wants to keep their configuration private, the S-CSCF will have chosen an I-CSCF(THIG) who will perform the configuration hiding and pass messages to the P-CSCF (procedure MT#1).

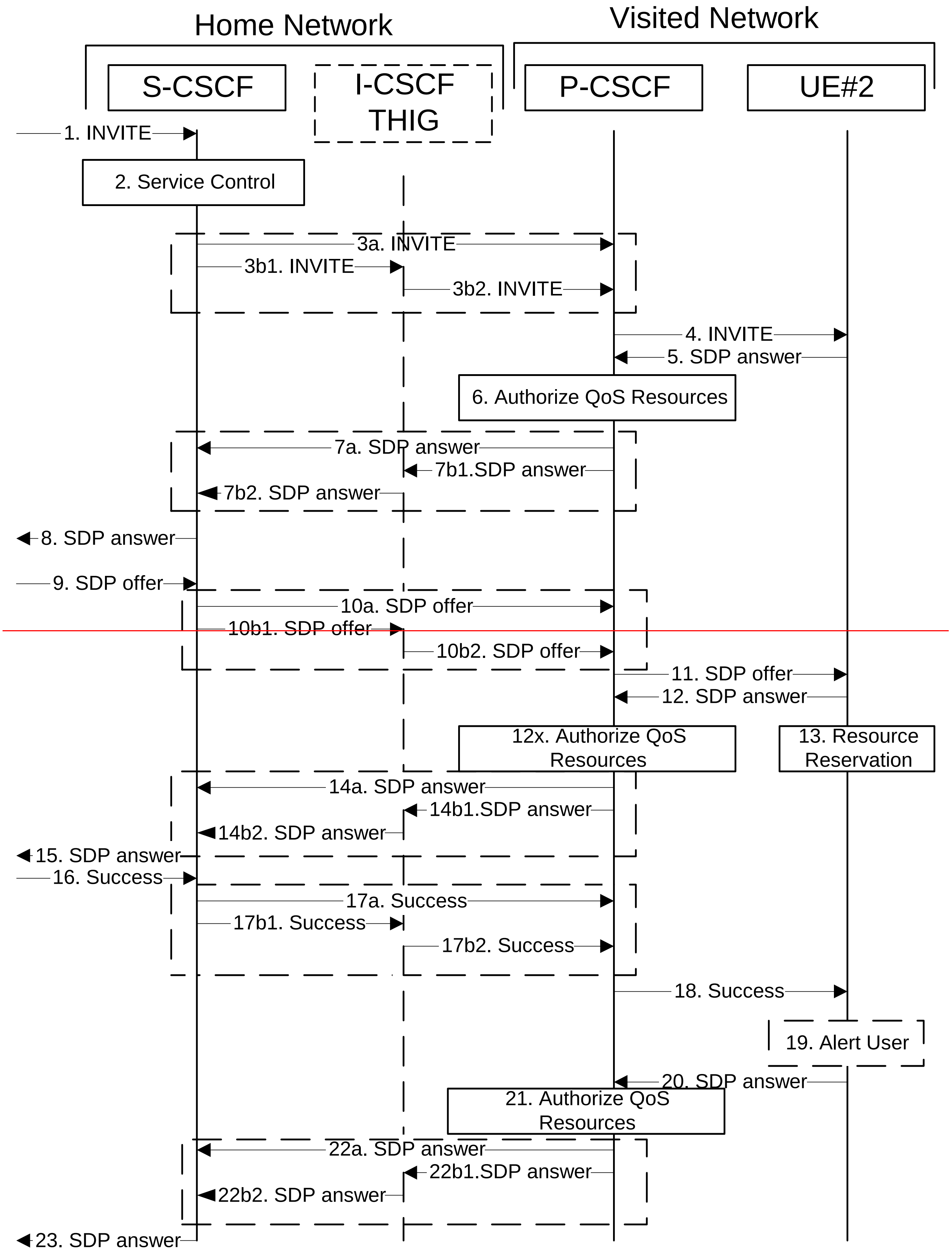
Sessions destined to the PSTN are a special case of the Termination procedures. The MGCF uses H.248 to control a Media Gateway, and communicates with the SS7 network. The MGCF receives and processes SIP requests, and subsequent nodes consider the signalling as if it came from a S-CSCF.

### 5.7.1 (MT#1) Mobile termination, roaming

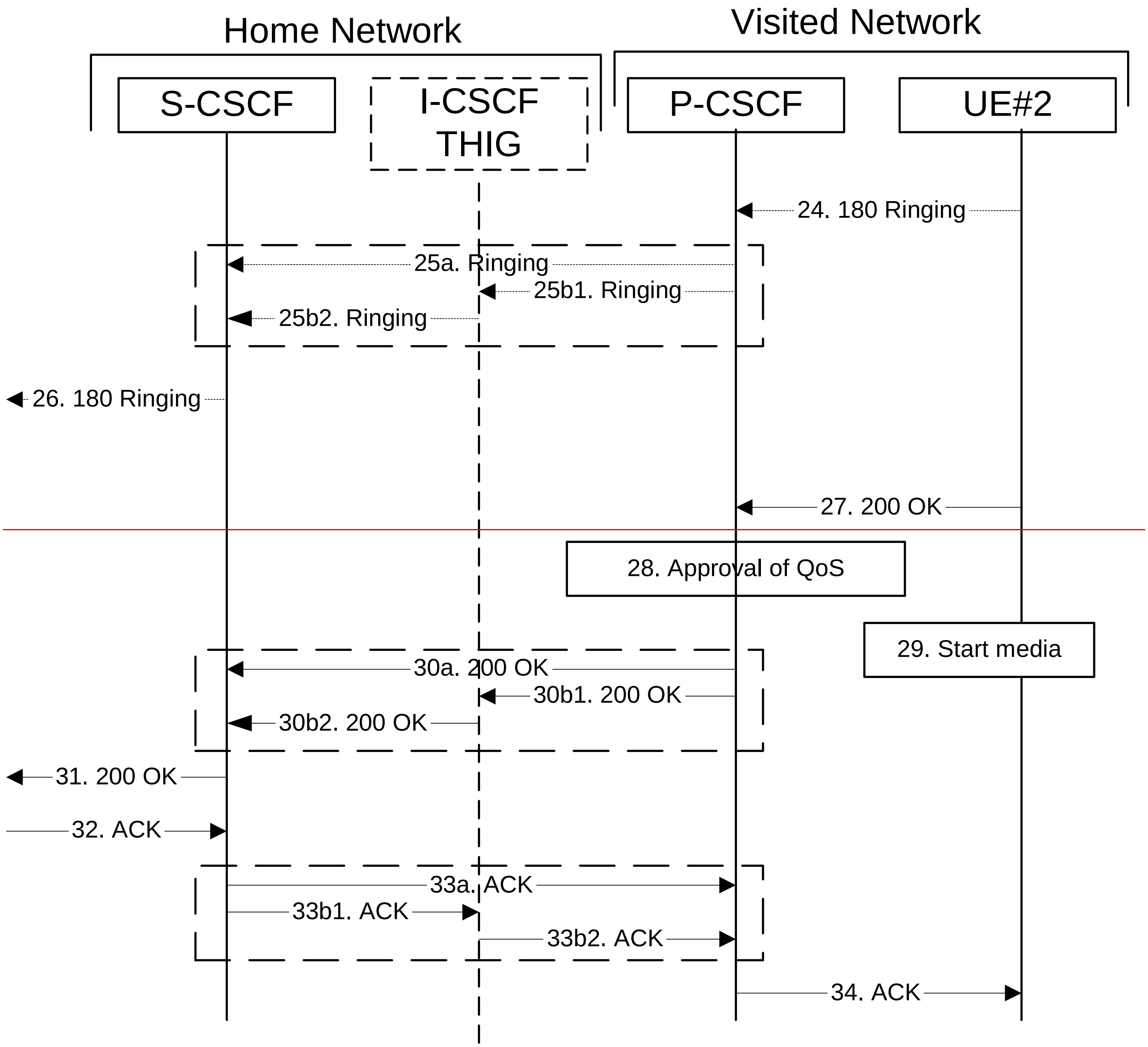
This termination procedure applies to roaming subscribers.

The UE is located in a visited network, and determines the P-CSCF via the CSCF discovery procedure described in section 5.1.1. The home network advertises either the S-CSCF, or an I-CSCF(THIG), as the entry point from the visited network.

When registration is complete, S-CSCF knows the name/address of its next hop in the signalling path, either I-CSCF or P-CSCF, I-CSCF (if it exists) knows the name/address of P-CSCF, and P-CSCF knows the name/address of the UE.


Home Network
Visited Network
S-CSCF
I-CSCF THIG
P-CSCF
UE#2
1. INVITE
2. Service Control
3a. INVITE
3b1. INVITE
3b2. INVITE
4. INVITE
5. SDP answer
6. Authorize QoS Resources
7a. SDP answer
7b1.SDP answer
7b2. SDP answer
8. SDP answer
9. SDP offer
10a. SDP offer
10b1. SDP offer
10b2. SDP offer
11. SDP offer
12. SDP answer
12x. Authorize QoS Resources
13. Resource Reservation
14a. SDP answer
14b1.SDP answer
14b2. SDP answer
15. SDP answer
16. Success
17a. Success
17b1. Success
17b2. Success
18. Success
19. Alert User
20. SDP answer
21. Authorize QoS Resources
22a. SDP answer
22b1.SDP answer
22b2. SDP answer
23. SDP answer

~~Figure 5.17-1: Mobile termination procedure - roaming (part 1)~~


Home Network
Visited Network
S-CSCF
I-CSCF THIG
P-CSCF
UE#2
24. 180 Ringing
25a. Ringing
25b1. Ringing
25b2. Ringing
26. 180 Ringing
27. 200 OK
28. Approval of QoS
29. Start media
30a. 200 OK
30b1. 200 OK
30b2. 200 OK
31. 200 OK
32. ACK
33a. ACK
33b1. ACK
33b2. ACK
34. ACK

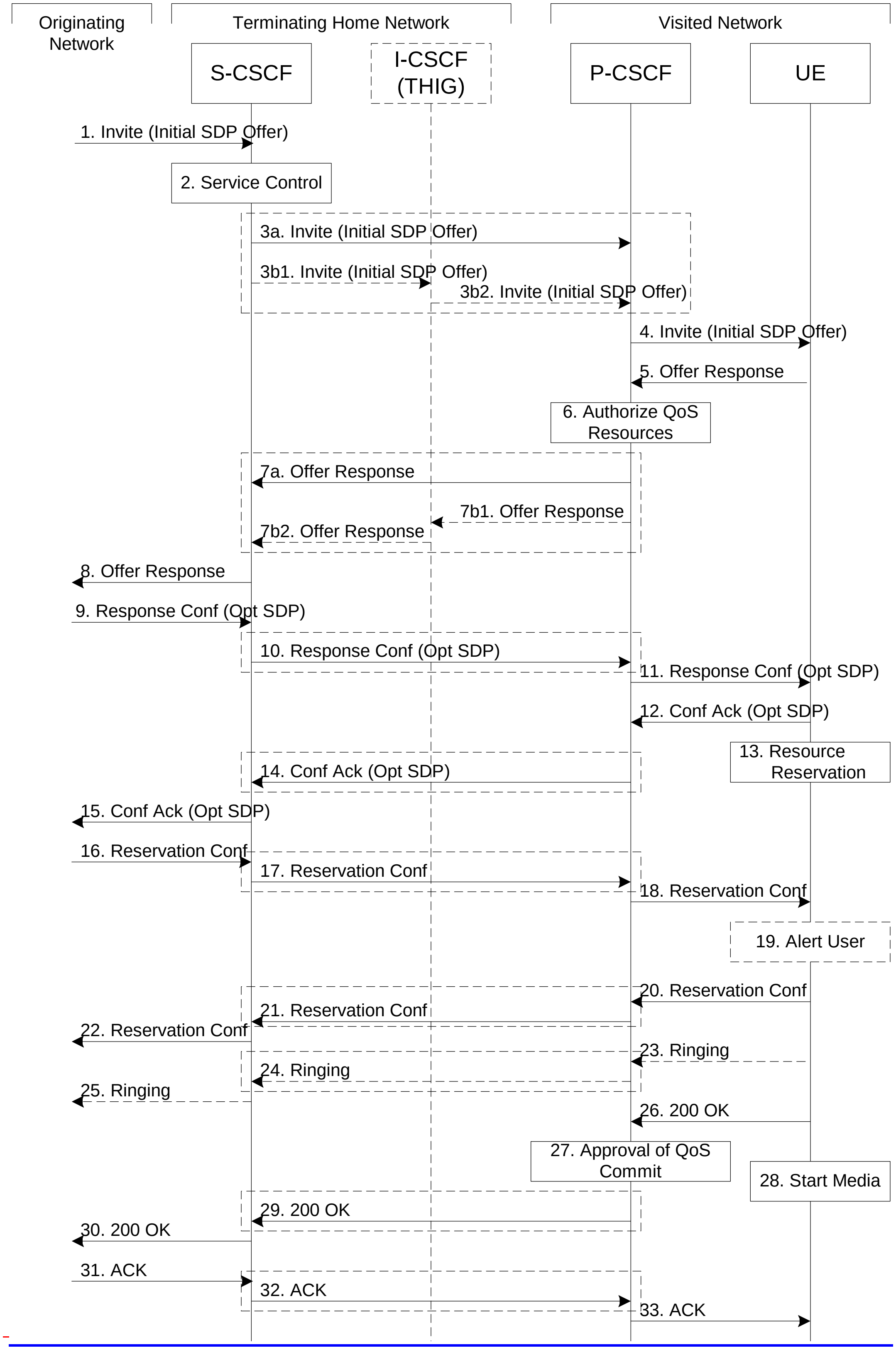


**Figure 5.17~~-2~~: Mobile termination procedure - roaming~~ (part 2)~~**

Procedure MT#1 is as follows:

1. The originating party sends the SIP INVITE request, containing an initial SDP, via one of the origination procedures, and via one of the Inter-Serving procedures, to the Serving-CSCF for the terminating subscriber.

2. S-CSCF validates the service profile, and performs any termination service control required for this subscriber. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

3. S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF in the visited network, possibly through an I-CSCF.

   This next hop is either the P-CSCF that is serving the visiting UE (choice (a)), or an I-CSCF(THIG) within the home network that is performing the configuration hiding function for the home network operator (choice (b)).

   (3a) If the home network operator does not desire to keep their network configuration hidden, the INVITE request is forwarded directly to the P-CSCF.

   (3b) If the home network operator desires to keep their network configuration hidden, the INVITE request is forwarded through an I-CSCF(THIG) to the P-CSCF.

   (3b1) S-CSCF forwards the INVITE request to I-CSCF(THIG)

   (3b2) I-CSCF(THIG) forwards the INVITE request to P-CSCF

4. The Authorization-Token is generated by the PCF and included in the INVITE message. P-CSCF remembers (from the registration procedure) the UE address, and forwards the INVITE to the UE.

5. UE determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with an ~~SDP~~ Offer Response message back to the originator. ~~This~~ The SDP may represent one or more media for a multi-media session. This response is sent to P-CSCF.

6. P-CSCF authorises the resources necessary for this session.

7. P-CSCF forwards the ~~SDP~~ Offer Response message to S-CSCF. Based on the choice made in step #3 above, this may be sent directly to S-CSCF (7a) or may be sent through I-CSCF(THIG) (7b1 and 7b2).

8. S-CSCF forwards the Offer Response~~SDP~~ message to the originator, per the S-S procedure.

9. The originating endpoint sends ~~the offered SDP to be used in this session,~~ a Response Confirmation via the S-S procedure, to S-CSCF. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response sent in Step 8 or a subset. If new media are defined by this SDP, a new authorization (as in Step 6) will be done by the P-CSCF(PCF) following Step 12. The originating UE is free to continue to offer new media on this operation or on subsequent exchanges using the Update method. Each offer/answer exchange will cause the P-CSCF(PCF) to repeat the Authorization step (Step 6) again.

10. S-CSCF forwards the ~~offered SDP~~Response Confirmation to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF. Step 10 may be similar to Step 3 depending on whether or not configuration hiding is used.

11. P-CSCF forwards the ~~offered SDP~~Response Confirmation to UE.

12~~-12x~~. UE responds to the ~~offered resources and PCSCF authorises the resources~~Response Confirmation with an acknowledgement. If Optional SDP is contained in the Response Confirmation, the Confirmation Ack will also contain an SDP response. If the SDP has changed, the P-CSCF authorizes that the resources are allowed to be used.

13. UE initiates the reservation procedures for the resources needed for this session.

14-15. PCSCF forwards the ~~resource answer~~Confirmation Ack to the S-CSCF and then to the originating end point via session path. Step 14 may be similar to Step 7 depending on whether or not configuration hiding is used.

16-18. When the originating endpoint has completed its resource reservation, it sends the successful Resource Reservation message to S-CSCF, via the S-S procedures. The S-CSCF forwards the message toward the terminating endpoint along the signalling path. Step 17 may be similar to Step 3 depending on whether or not configuration hiding is used.

~~17. S-CSCF forwards the message to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.~~

~~18. P-CSCF forwards the message to UE.~~

19. UE#2 alerts the destination subscriber of an incoming session setup attempt.

20-~~23~~22. UE#2 responds to the successful resource reservation towards the originating end point. Step 21 may be similar to Step 7 depending on whether or not configuration hiding is used.

~~24~~23-25. UE may alert the user and wait for an indication from the user before completing the session setup. If so, it indicates this to the originating party by a provisional response indicating Ringing. This message is sent to P-CSCF and along the signalling path to the originating end. Step 24 may be similar to Step 7 depending on whether or not configuration hiding is used.

~~25. P-CSCF forwards the Ringing message to S-CSCF. Based on the choice made in step #3 above, this may be sent directly to S-CSCF (18a) or may be sent through I-CSCF(THIG) (18b1 and 18b2).~~

~~26. S-CSCF forwards this message to the originating endpoint, per the S-S procedure.~~

~~27~~26. When the destination party answers, the UE sends a SIP 200-OK final response to P-CSCF.

~~28~~27. P-CSCF indicates the resources reserved for this session should now be committed.

~~29~~28. UE starts the media flow(s) for this session

29-30. P-CSCF sends a SIP 200-OK final response along the signalling path back to the S-CSCF ~~Based on the choice made in (3) above, this response may either be sent directly from P-CSCF to S-CSCF (choice (a)), or be sent indirectly through the I-CSCF(THIG) (choice (b)).~~ Step 29 may be similar to Step 7 depending on whether or not configuration hiding is used.

~~31. S-CSCF forwards the SIP 200-OK final response along the signalling path back to the session originator, as per the S-S procedure.~~

~~32~~31-33. The originating party responds to the 200-OK final response with a SIP ACK message that is sent to S-CSCF via the S-S procedure and forwarded to the terminating end along the signalling path. Step 32 may be similar to Step 3 depending on whether or not configuration hiding is used.

~~33. S-CSCF forwards the SIP ACK message to P-CSCF. This may possibly be routed through the I-CSCF depending on operator configuration of the I-CSCF.~~

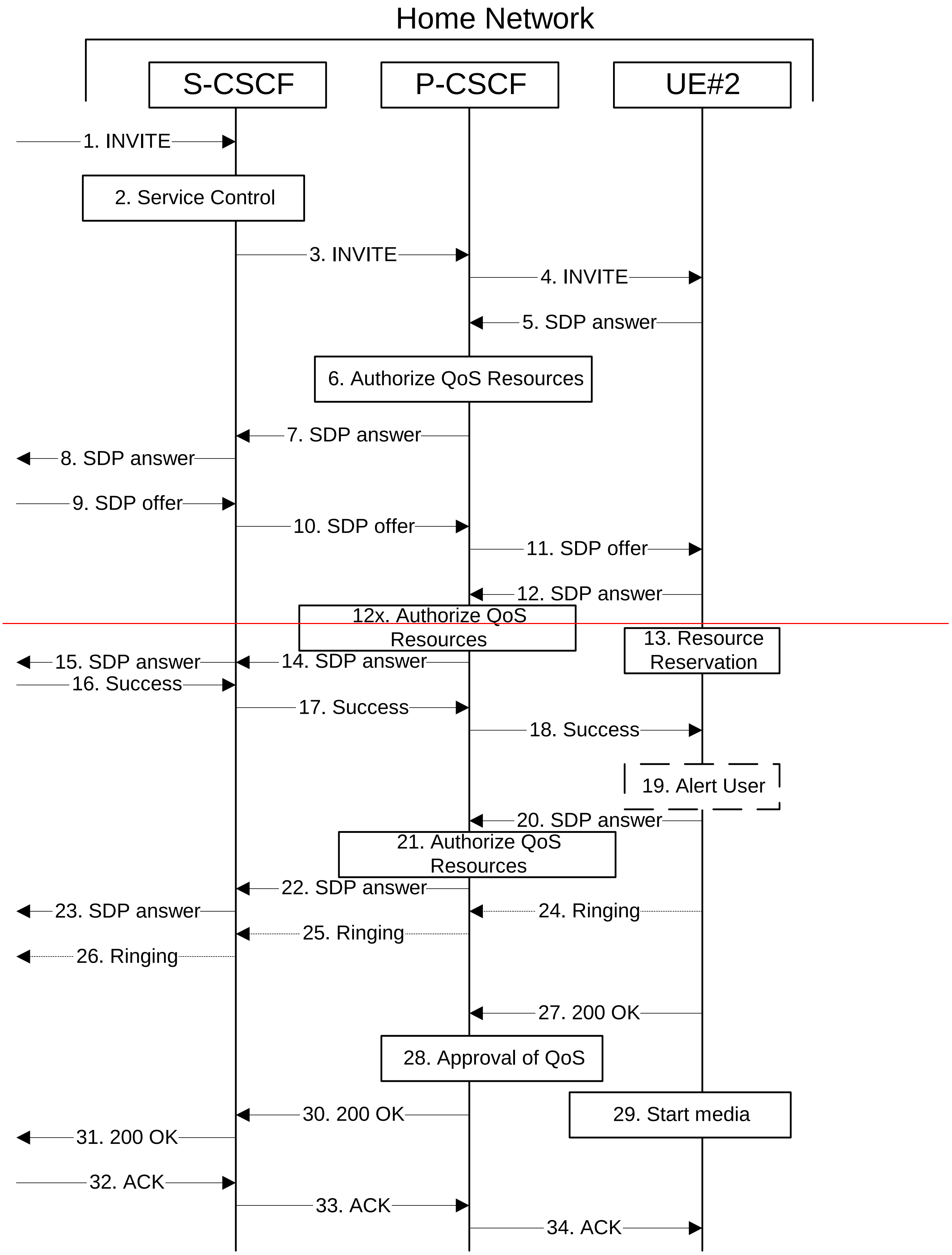
~~34. P-CSCF forwards the ACK message to UE.~~

### 5.7.2 (MT#2) Mobile termination, home

This termination procedure 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 procedures described in section 5.1.1.

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


Home Network
S-CSCF
P-CSCF
UE#2
1. INVITE
2. Service Control
3. INVITE
4. INVITE
5. SDP answer
6. Authorize QoS Resources
7. SDP answer
8. SDP answer
9. SDP offer
10. SDP offer
11. SDP offer
12. SDP answer
12x. Authorize QoS Resources
13. Resource Reservation
15. SDP answer
14. SDP answer
16. Success
17. Success
18. Success
19. Alert User
20. SDP answer
21. Authorize QoS Resources
22. SDP answer
23. SDP answer
24. Ringing
25. Ringing
26. Ringing
27. 200 OK
28. Approval of QoS
29. Start media
30. 200 OK
31. 200 OK
32. ACK
33. ACK
34. ACK

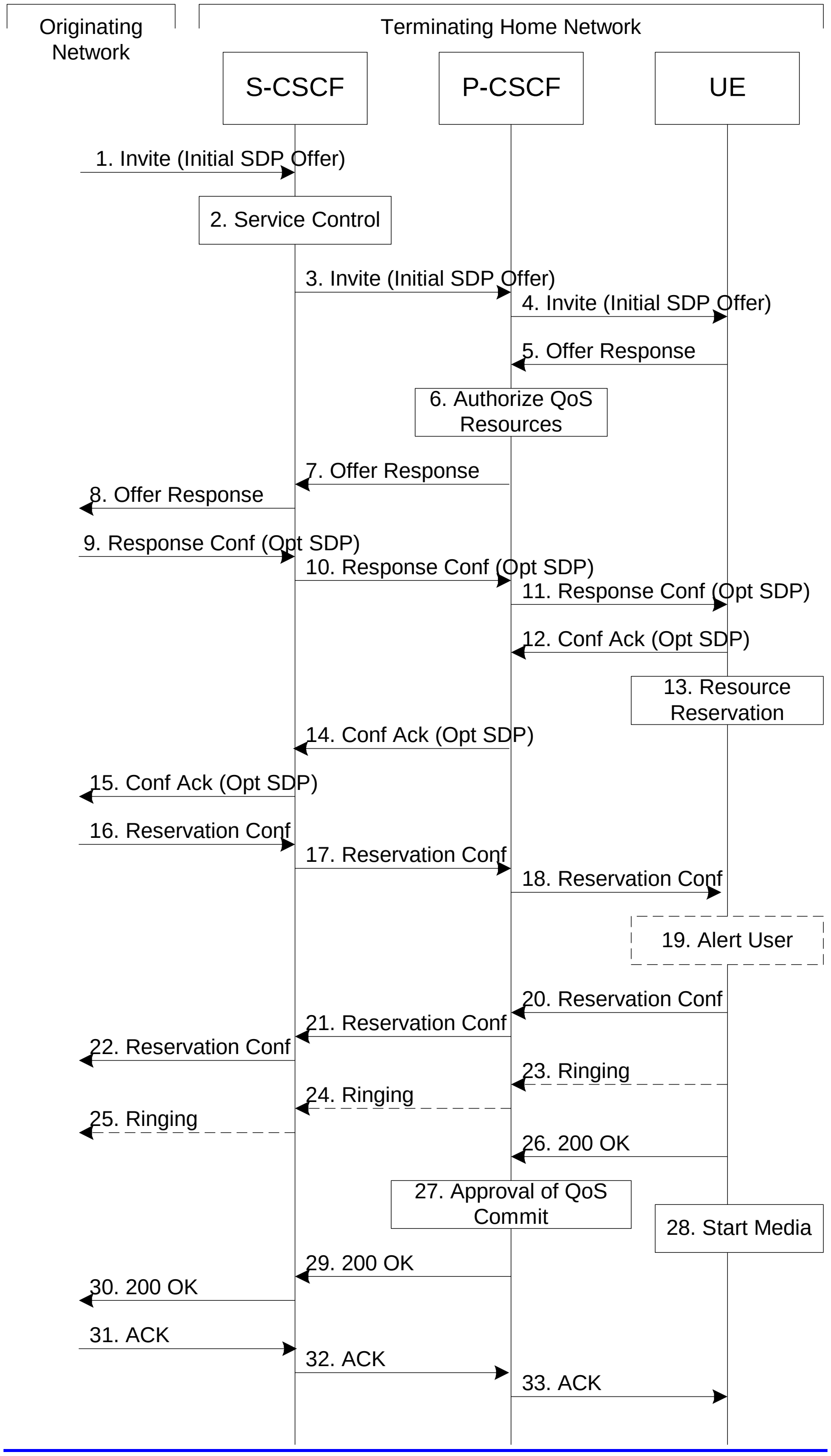


**Figure 5.18: Mobile termination procedure - home**

Procedure MT#2 is as follows:

1. UE#1 sends the SIP INVITE request, containing an initial SDP, via one of the origination procedures, and via one of the Serving to Serving-CSCF procedures, to the Serving-CSCF for the terminating subscriber.

2. S-CSCF validates the service profile, and performs any termination service control required for this subscriber. This includes authorisation of the requested SDP based on the user's subscription for multi-media services.

3. S-CSCF remembers (from the registration procedure) the next hop CSCF for this UE. It forwards the INVITE to the P-CSCF in the home network.

4. The Authorization-Token is generated by the PCF and included in the INVITE message. P-CSCF remembers (from the registration procedure) the UE address, and forwards the INVITE to the UE.

5. UE determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with an ~~SDP~~ Offer Response message back to the originator. ~~This~~ The SDP may represent one or more media for a multi-media session. This response is sent to P-CSCF.

6. P-CSCF authorises the resources necessary for this session.

7. P-CSCF forwards the Offer Response~~SDP~~ message to S-CSCF.

8. S-CSCF forwards the Offer Response~~SDP~~ message to the originator, per the S-S procedure.

9. The originating endpoint sends ~~the offered SDP to be used in this session,~~a Response Confirmation via the S-S procedure, to S-CSCF. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response sent in Step 8 or a subset. If new media are defined by this SDP, a new authorization (as in Step 6) will be done by the P-CSCF(PCF) following Step 12. The originating UE is free to continue to offer new media on this operation or on subsequent exchanges using the Update method. Each offer/answer exchange will cause the P-CSCF(PCF) to repeat the Authorization step (Step 6) again.

10. S-CSCF forwards the ~~offered SDP~~Response Confirmation to P-CSCF.

11. P-CSCF forwards the Response Confirmation~~offered SDP~~ to UE.

12~~-12x~~. UE responds to the Response Confirmation with an acknowledgement. If Optional SDP is contained in the Response Confirmation, the Confirmation Ack will also contain an SDP response. If the SDP has changed, the P-CSCF authorizes that the resources are allowed to be used.~~offered SDP and P-CSCF authorises the response.~~

13. UE initiates the reservation procedures for the resources needed for this session.

14-15. The response is forwarded to the originating end point.

16-18. When the originating endpoint has completed its resource reservation, it sends the successful Resource Reservation message to S-CSCF, via the S-S procedures. The S-CSCF forwards the message toward the terminating endpoint along the signalling path.

~~17. S-CSCF forwards the message to P-CSCF.~~

~~18. P-CSCF forwards the message to UE.~~

19. UE#2 alerts the destination subscriber of an incoming session setup attempt.

20-22~~3~~. UE#2 responds to the successful resource reservation ~~and P-CSCF authorises the possible response offer~~ and the message is forwarded to the originating end.

~~24~~23-25. UE may alert the user and wait for an indication from the user before completing the session. If so, it indicates this to the originating party by a provisional response indicating Ringing. This message is sent to P-CSCF~~.~~ and along the signalling path to the originating end.

~~25. P-CSCF forwards the Ringing message to S-CSCF.~~

~~26. S-CSCF forwards this message to the originating endpoint, per the S-S procedure.~~

~~27~~26. When the destination party answers, UE sends a SIP 200-OK final response to P-CSCF.

~~28~~27. P-CSCF indicates the resources reserved for this session should now be committed.

~~29~~28. UE starts the media flow(s) for this session.

29-30. P-CSCF forwards the 200-OK to S-CSCF, following the ~~path of the INVITE request in step (3) above~~signaling path.

~~31. S-CSCF performs any service control required on session setup completion.~~

~~32. S-CSCF forwards the 200-OK final response, as per the appropriate S-S procedure.~~

~~33~~31-33. The session originator responds to the 200-OK by sending the ACK message to S-CSCF via the S-S procedure and it is forwarded to the terminating end along the signalling path..

~~34. S-CSCF forwards the SIP ACK message to P-CSCF.~~

~~35. P-CSCF forwards the ACK message to UE.~~

## 5.7.2a (MT#3) Mobile termination, CS Domain roaming

This termination procedure applies to a subscriber registered for CS services, either in the home network or in a visited network. The subscriber has both IMS and CS subscriptions but is unregistered for IMS services

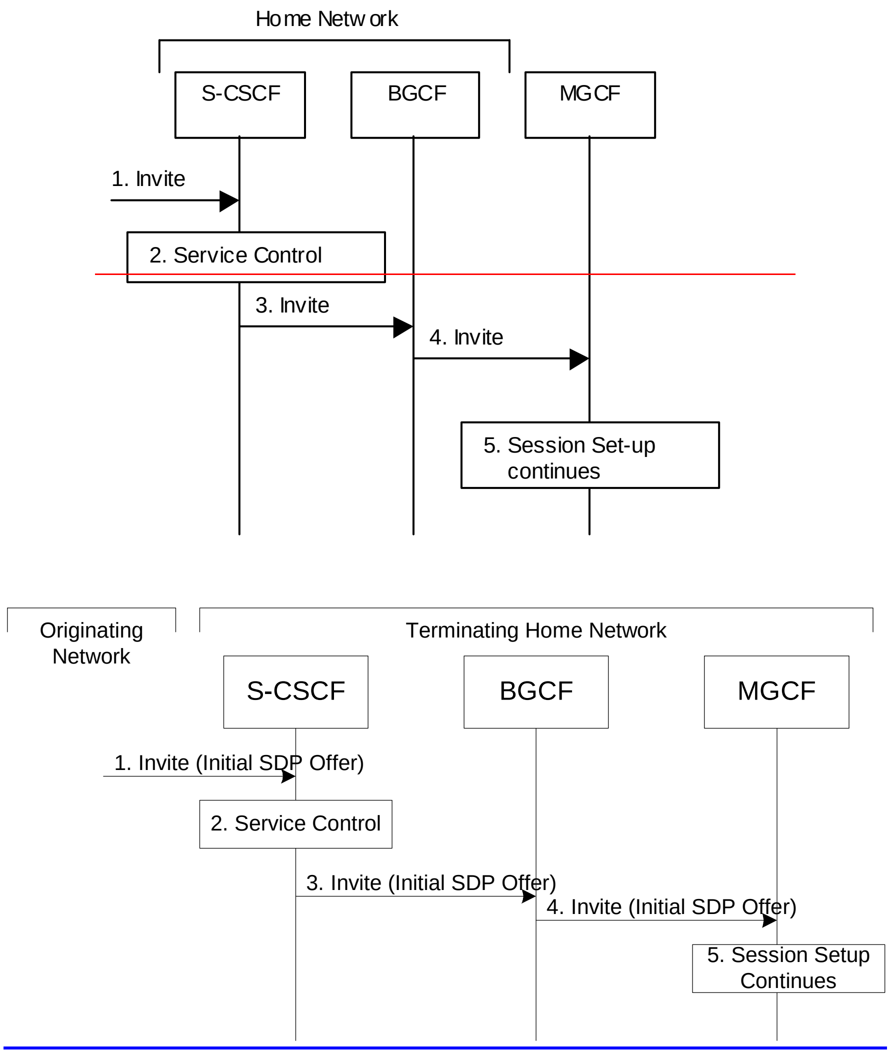


**Figure 5.18a: Mobile Terminating procedures to a subscriber that is unregistered for IMS services but is registered for CS services**

1. In case the terminating subscriber does not have an S-CSCF allocated, the session attempt is routed according to the section 5.12.1 (Mobile Terminating procedures to unregistered IMS subscriber that has services related to unregistered state).
2. S-CSCF invokes service control appropriate for this session setup attempt, which may result in e.g. re-routing the session to a messaging service, or continued routing towards the subscriber's CS domain termination address (e.g. E.164).
3. S-CSCF performs whatever further actions are appropriate for this session setup attempt. In case of routing towards the subscriber's CS domain termination address, the S-CSCF performs an analysis of this address. From the analysis of the destination address, S-CSCF determines that this is for the CS domain, and passes the request to the BGCF.
4. The BGCF forwards the SIP INVITE message to the appropriate MGCF in the home network, or to a BGCF in another network. This depends on the PSTN interworking configuration of the IMS network. Eventually, the session initiation arrives to an MGCF.
5. Normal session setup continues according to PSTN-T flow as described in Section 5.7.3

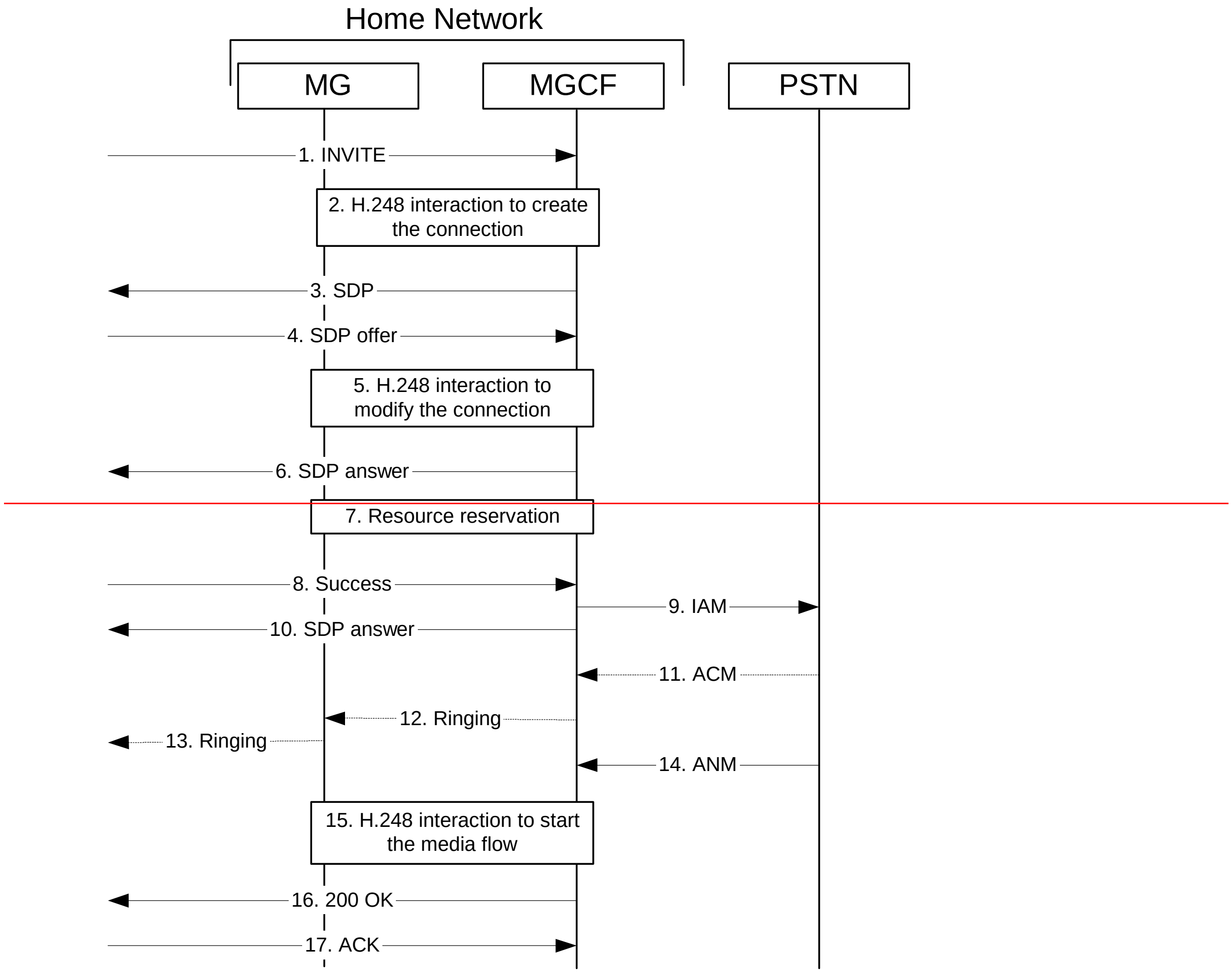
### 5.7.3 (PSTN-T) PSTN termination

The MGCF in the IM CN subsystem is a SIP endpoint that initiates and receives requests on behalf of the PSTN and Media Gateway (MGW).Other nodes consider the signalling as if it came from a S-CSCF. The MGCF incorporates the network security functionality of the S-CSCF.

PSTN termination may be done in the same operator’s network as the S-CSCF of the session originator. Therefore, the location of the MGCF/MGW are given only as “Terminating Network” rather than “Home Network” or “Visited Network.”

Further, agreements between network operators may allow PSTN termination in a network other than the originator’s visited network or home network. This may be done, for example, to avoid long distance or international tariffs.

This termination procedure can be used for any of the inter-serving procedures, in place of the S-CSCF.


Home Network
MG
MGCF
PSTN
1. INVITE
2. H.248 interaction to create the connection
3. SDP
4. SDP offer
5. H.248 interaction to modify the connection
6. SDP answer
7. Resource reservation
8. Success
9. IAM
10. SDP answer
11. ACM
12. Ringing
13. Ringing
14. ANM
15. H.248 interaction to start the media flow
16. 200 OK
17. ACK

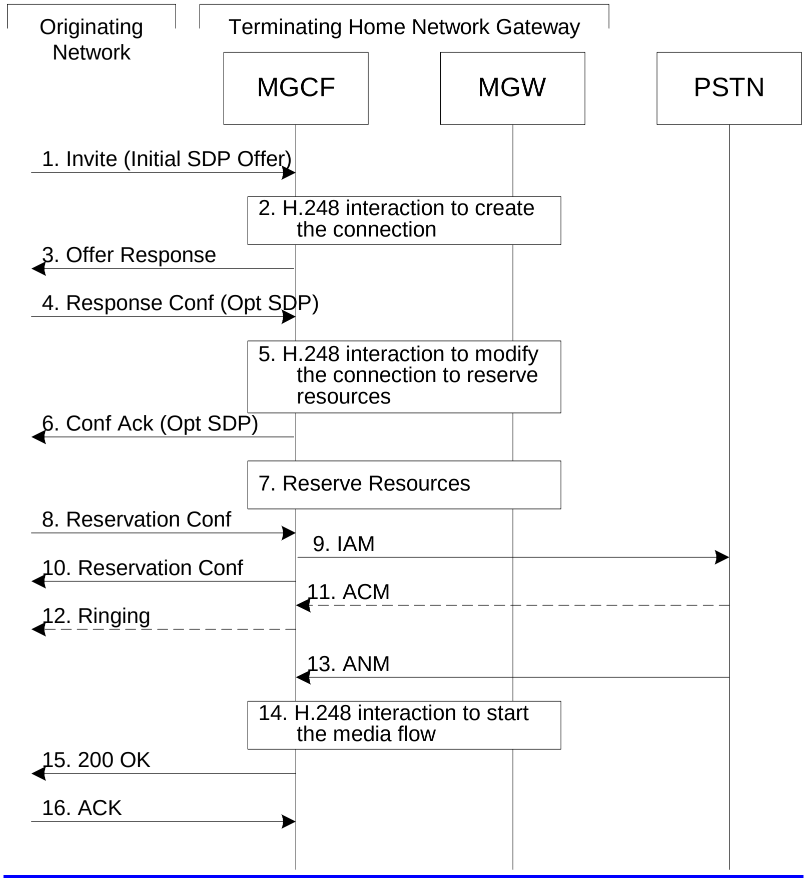

Originating Network
Terminating Home Network Gateway
MGCF
MGW
PSTN
1. Invite (Initial SDP Offer)
2. H.248 interaction to create the connection
3. Offer Response
4. Response Conf (Opt SDP)
5. H.248 interaction to modify the connection to reserve resources
6. Conf Ack (Opt SDP)
7. Reserve Resources
8. Reservation Conf
9. IAM
10. Reservation Conf
11. ACM
12. Ringing
13. ANM
14. H.248 interaction to start the media flow
15. 200 OK
16. ACK

**Figure 5.19: PSTN termination procedure**

The PSTN termination procedure is as follows:

1. MGCF receives an INVITE request, containing an initial SDP, through one of the origination procedures and via one of the inter-serving procedures.

2. MGCF initiates a H.248 interaction to pick an outgoing channel and determine media capabilities of the MGW.

3. MGCF determines the subset of the media flows proposed by the originating endpoint that it supports, and responds with an ~~SDP~~ Offer Response message back to the originator. This response is sent via the S-S procedure.

4. The originating endpoint sends ~~the offered SDP~~a Response Confirmation. The Response Confirmation may also contain SDP. This may be the same SDP as in the Offer Response sent in Step 3 or a subset. The originating UE is free to continue to offer new media on this operation or on subsequent exchanges using the Update method. ~~to be used in this session, via the S-S procedure, to MGCF.~~

5. MGCF initiates a H.248 interaction to modify the connection established in step #2 and instruct MGW to reserve the resources necessary for the media streams.

6. MGCF responds to the offered media towards the originating party.

7. MGW reserved the resources necessary for the media streams.

8. When the originating endpoint has completed its resource reservation, it sends the successful Resource Reservation message to MGCF, via the S-S procedures.

9. MGCF sends an IAM message to the PSTN

10. MGCF sends response to the successful resource reservation towards originating end.

11. The PSTN establishes the path to the destination. It may optionally alert the destination user before completing the session. If so, it responds with an ACM message.

12~~ 13~~. If the PSTN is alerting the destination user, MGCF indicates this to the originating party by a provisional response indicating Ringing. This message is sent via the S-S procedures.

~~14~~13. When the destination party answers, the PSTN sends an ANM message to MGCF

~~15~~14. MGCF initiates a H.248 interaction to make the connection in the MGW bi-directional.

~~16~~15. MGCF sends a SIP 200-OK final response along the signalling path back to the session originator

~~17~~16. The Originating party acknowledges the final response with a SIP ACK message

**3GPP TSG-SA2 Meeting #26**
**Toronto, Canada, 19-23.08.2002**

***S2-022557***

*CR-Form-v7*

# CHANGE REQUEST

⌘ **23.228** **CR** **199** ⌘ **rev** **1** ⌘ Current version: **5.5.0** ⌘

*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:*** | ⌘ | Emergency sessions | | |
| ***Source:*** | ⌘ | Nokia | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 14.08.2002 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | REL-5 |

| | | | |
|---|---|---|---|
| *Use one of the following categories:* | | *Use one of the following releases:* | |
| ***F*** | *(correction)* | *2* | *(GSM Phase 2)* |
| ***A*** | *(corresponds to a correction in an earlier release)* | *R96* | *(Release 1996)* |
| ***B*** | *(addition of feature),* | *R97* | *(Release 1997)* |
| ***C*** | *(functional modification of feature)* | *R98* | *(Release 1998)* |
| ***D*** | *(editorial modification)* | *R99* | *(Release 1999)* |
| Detailed explanations of the above categories can | | *Rel-4* | *(Release 4)* |
| be found in 3GPP TR 21.900. | | *Rel-5* | *(Release 5)* |
| | | *Rel-6* | *(Release 6)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | The class C terminal may be CS capable. Especially when a class C terminal is using circuit switced services it should be able to make emergency calls. |
| ***Summary of change:*** | ⌘ | The emergency session requirement is clarified and the misleading note is removed. |
| ***Consequences if not approved:*** | ⌘ | Misleading text is included in the specification. |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.13 | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | | | Other core specifications | ⌘ | |
| | | | | Test specifications | | |
| | | | | O&M Specifications | | |
| ***Other comments:*** | ⌘ | See 22.060 for definition of the GPRS UE Classes. | | | | |

## 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:

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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.

# 5.13 Emergency sessions

## 5.13.1 Requirements for Emergency Sessions

Emergency sessions via IMS are not supported in this release of the present document. A CS capable UE shall use the CS domain for emergency services.

~~For emergency services, an R5 UE shall use the CS domain.~~

~~Note: Class C terminals cannot connect to emergency services.~~

**3GPP TSG-SA WG2 Meeting #26**
**Toronto, Canada, 19th 23rd August**

***Tdoc* S2-022125**

*CR-Form-v7*

# CHANGE REQUEST

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | 187 | ⌘**rev** | **-** | ⌘ | Current version: | **5.5.0** | ⌘ |

*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:*** | ⌘ | Deletion of ISC interface support for control of timers | | |
| ***Source:*** | ⌘ | dynamicsoft | | |
| ***Work item code:*** | ⌘ | IMS | ***Date:*** ⌘ | 5/08/02 |
| ***Category:*** | ⌘ | **F**<br>*Use one of the following categories:*<br>***F*** *(correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(addition of feature),*<br>***C*** *(functional modification of feature)*<br>***D*** *(editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | ***Release:*** ⌘ | Rel-5<br>*Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*Rel-4 (Release 4)*<br>*Rel-5 (Release 5)*<br>*Rel-6 (Release 6)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | TS 23.218 does not specify the ISC interface being used to control timers and TS 24.229 does not provide a means in the protocol to do so. In addition it is unclear what if any timers need to be controlled in any node and which node would do the controlling. In addition no means currently exists in SIP to control timer values and it is too late to add this to the protocol in release 5. No proposals have been presented in CN1 that the ISC interface should have enhancements to support the control of timers. |
| ***Summary of change:*** | ⌘ | Deletion of requirement in Rel 5 for ISC interface to support the control of timers in clause 4.2.4. |
| ***Consequences if not approved:*** | ⌘ | Stage 2 and stage 3 will not be in alignment |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 4.2.4 | | | | |
| | | **Y** | **N** | | | |
| ***Other specs affected:*** | ⌘ | | **X** | Other core specifications | ⌘ | |
| | | | **X** | Test specifications | | |
| | | | **X** | O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | | | |

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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.

### 4.2.4 IP multimedia Subsystem Service Control Interface (ISC)

The ISC interface is between the Serving CSCF and the service platform(s).

An Application Server (AS) offering value added IM services resides either in the user's home network or in a third party location. The third party could be a network or simply a stand-alone AS.

The Serving-CSCF to AS interface is used to provide services residing in an AS. Two cases were identified:

- Serving-CSCF to an AS in Home Network.
- Serving-CSCF to an AS in External Network (e.g., Third Party or Visited)

Regarding the general provision of services in the IMS, the following statements shall guide the further development.

1. Besides the Cx interface the S-CSCF supports only one standardised protocol for service control, which delegates service execution to an “Application Server”.

2. The depicted functional architecture does not propose a specific physical implementation.

3. Scope of the SIP Application Server: the SIP Application Server may host and execute services. It is intended to allow the SIP Application Server to influence and impact the SIP session on behalf of the services and it uses the ISC interface to communicate with the S-CSCF.

4. The S-CSCF shall decide whether an Application Server is required to receive information related to an incoming SIP session request to ensure appropriate service handling.. The decision at the S-CSCF is based on (filter) information received from the HSS (or other sources, e.g. application servers). This filter information is stored and conveyed on a per application server basis for each subscriber. The name(s)/address(es) information of the application server(s) are received from the HSS.

5. The purpose of the IM SSF is to host the CAMEL network features (i.e. trigger detection points, CAMEL Service Switching Finite State Machine, etc) and to interface to CAP.

6. The IM SSF and the CAP interface support legacy services only.

7. Once the IM SSF, OSA SCS or SIP Application Server has been informed of a SIP session request by the S-CSCF, the IM SSF, OSA SCS or SIP Application Server shall ensure that the S-CSCF is made aware of any resulting activity by sending messages to the S-CSCF.

8. From the perspective of the S-CSCF, The “SIP Application server”, “OSA service capability server” and “IM-SSF” shall exhibit the same interface behaviour.

9. The application server may contain “service capability interaction manager” (SCIM) functionality and other application servers. The SCIM functionality is an application which performs the role of interaction management. The internal components are represented by the “dotted boxes” inside the SIP application server. The internal structure of the application server is outside the standards.
   The Sh interface shall have sufficient functionality to enable this scenario.

10. When the name/address of more than one “application server” is transferred from the HSS, the S-CSCF shall contact the “application servers” in the order supplied by the HSS. The response from the first “application server” shall be used as the input to the second “application server”. Note that these multiple “application servers” may be any combination of the SIP Application server, OSA service capability server, or IM-SSF types.

11. The S-CSCF does not handle service interaction issues..

12. The S-CSCF does not provide authentication and security functionality for secure direct third party access to the IM subsystem. The OSA framework provides a standardized way for third party secure access to the IM subsystem.

More specifically the following requirements apply to the IMS Service control interface:

1. The ISC interface shall be able to convey charging information.

~~2. The protocol on the ISC interface shall support the control of timers~~

2~~3~~. The protocol on the ISC interface shall allow the S-CSCF to differentiate between session control on Mw, Mm and Mg interfaces and the ISC interface.

The figure below depicts an overall view of how services can be provided.

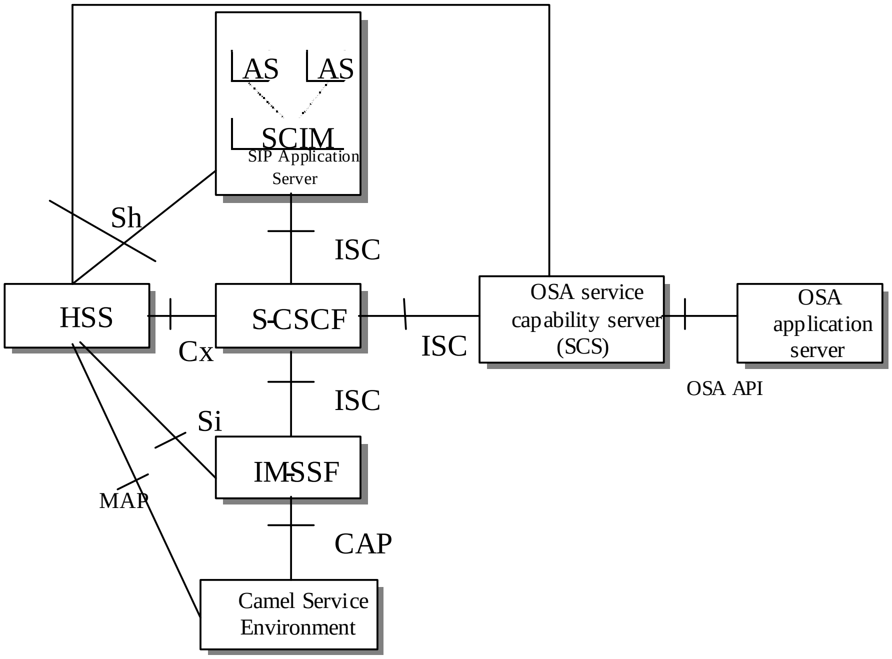

**Figure 4.3: Functional architecture for the provision of service in the IMS**

The protocol to be used on the ISC interface shall be SIP (as defined by RFC 3261 [12], other relevant RFC's, and additional enhancements introduced to support 3GPP´s needs on the Mw, Mm, Mg interfaces). On the ISC interface, extensions to SIP shall be avoided but are not expressly prohibited.

The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the Mw, Mm and Mg interfaces is sent on the ISC interface. The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the ISC interface is sent on the Mw, Mm and Mg interfaces.

Concerning the relationship between the SIP legs of the ISC interface and the SIP legs of the Mw, Mm, and Mg interfaces the S-CSCF acts as a SIP proxy, as shown in Figures 4.a-4e below.

Figures 4.3a-4.3e below depict the possible high-level interactions envisioned between the S-CSCF and the Application Server.

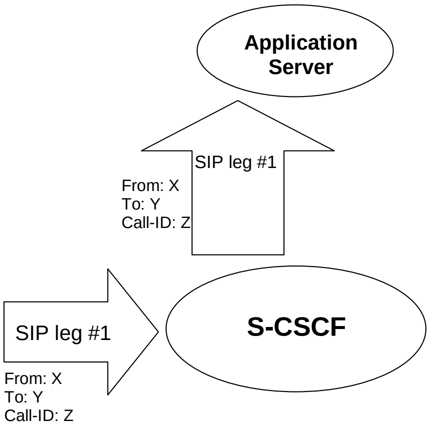

**Figure 4.3a: Application Server acting as terminating UA, or redirect server**

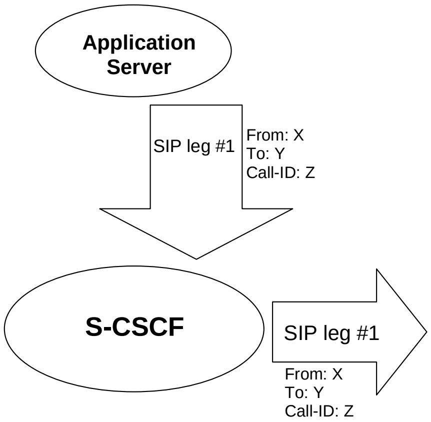

**Figure 4.3b: Application Server acting as originating UA**

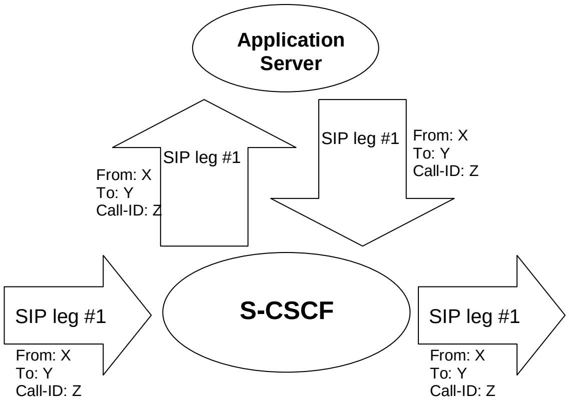

**Figure 4.3c: Application Server acting as a SIP proxy**

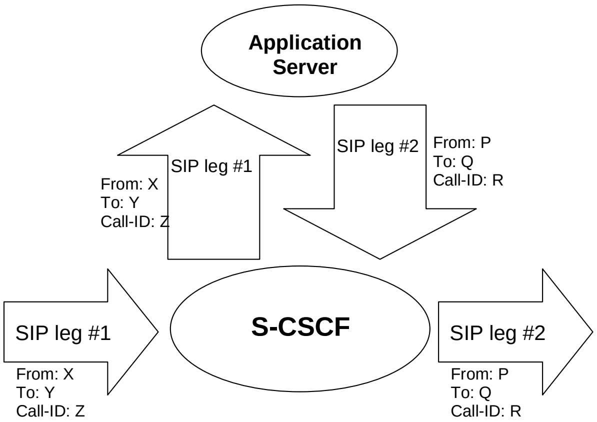

**Figure 4.3d: Application Server performing 3rd party call control**

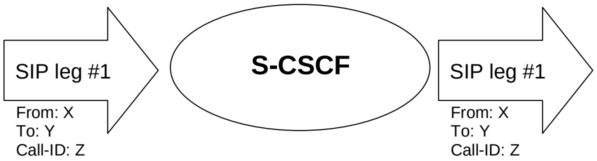

**Figure 4.3e: A SIP leg is passed through the S-CSCF without Application Server involvement**

**3GPP TSG-SA2 Meeting #26**
**Toronto, Canada, 19-23.8.2002**

***S2-022345***

*CR-Form-v5*

# CHANGE REQUEST

⌘ **23.228 CR 197** ⌘ **rev** ⌘ Current version: **5.5.0** ⌘

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

***Proposed change affects:*** ⌘ (U)SIM □ ME/UE □ Radio Access Network □ Core Network ☒

| | | | | |
|---|---|---|---|---|
| ***Title:*** | ⌘ | Private-ID cleanup | | |
| ***Source:*** | ⌘ | Nokia | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 19.08.2002 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | REL-5 |
| | | *Use one of the following categories:*<br>***F*** *(correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(addition of feature),*<br>***C*** *(functional modification of feature)*<br>***D*** *(editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | TS 23.228 defines the usage and nature of the Private User Identity. The current definition is somewhat vague and misleading with respect to which network elements obtain and store the Private User Identity. |
| ***Summary of change:*** | ⌘ | The role of HSS and S-CSCF in storing the Private User Identity is clarified. |
| ***Consequences if not approved:*** | ⌘ | The sub-clause defining the Private Identity in general would remain ambigous. |

| | | | |
|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 4.3.3.1 | |
| ***Other specs affected:*** | ⌘ | □ Other core specifications<br>□ Test specifications<br>□ O&M Specifications | ⌘ |
| ***Other comments:*** | ⌘ | | |

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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 and only set of changes **********************

### 4.3.3.1 Private user identities

Every IM CN subsystem subscriber shall have a private user identity. The private identity is assigned by the home network operator, and used, for example, for Registration, Authorisation, Administration, and Accounting purposes. This identity shall take the form of a Network Access Identifier (NAI) as defined in RFC 2486 [14]. It is possible for a representation of the IMSI to be contained within the NAI for the private identity.

- The Private User Identity is not used for routing of SIP messages.
- The Private User Identity shall be contained in all Registration requests, (including Re-registration and De-registration requests) passed from the UE to the home network.
- An ISIM application shall securely store the Private User Identity. It shall not be possible for the UE to modify the UICC's Private User Identity information.
- The Private User Identity is a unique global identity defined by the Home Network Operator, which may be used within the home network to uniquely identify the user from a network perspective.
- The Private User Identity shall be permanently allocated to a user (it is not a dynamic identity), and is valid for the duration of the user's subscription with the home network.
- The Private User Identity is used to identify the user's information (for example authentication information) stored within the HSS (for use for example during Registration).
- The Private User Identity may be present in charging records based on operator policies.
- The Private User Identity identifies the subscription (e.g. IM service capability) not the user.
- The Private User Identity is authenticated only during registration of the subscriber, (including re-registration and de-registration).
- The HSS ~~and S-CSCF~~ needs to ~~obtain and~~ store the Private User Identity.
- The S-CSCF needs to obtain and store the Private User Identity upon registration and unregistered termination.
- If the UICC does not contain an ISIM application, then the private user identity shall be derived from the USIM's IMSI, which allows for uniquely identifying the user within the 3GPP operator's network. The format of the private user identity derived from the IMSI is specified in 3GPP TS 23.003 [24].

**3GPP TSG-SA2 Meeting #26** **S2-022544**
**Toronto, Canada, 19-23.8.2002**

*CR-Form-v5*

# CHANGE REQUEST

⌘ **23.228 CR 198** ⌘**rev** **1** ⌘ Current version: **5.5.0** ⌘

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

***Proposed change affects:*** ⌘ (U)SIM □ ME/UE □ Radio Access Network □ Core Network ☒

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | ISC cleanup | | |
| ***Source:*** ⌘ | Nokia | | |
| ***Work item code:*** ⌘ | IMS-CCR | ***Date:*** ⌘ | 19.08.2002 |
| ***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)* |

***Reason for change:*** ⌘

RFC3261 has defined that a SIP dialog is identified by the following set of information: Call-ID, and the tag of the To: and From: headers. This should be correctly reflected in the sections describing the behaviour of SIP legs in relevant clauses of TS 23.228.
Additionaly, some old terminology (SIP+) is still present in the text, this should be corrected.

***Summary of change:*** ⌘

The SIP RFC has been referenced to correctly define a SIP leg which is identical to a SIP dialog. The ISC terminology is corrected.

***Consequences if not approved:*** ⌘ TS 23.228 would not be compatible with RFC3261, and some old ISC terminology would cause confusion.

***Clauses affected:*** ⌘ 4.2.4 and 4.2.4b

***Other specs affected:*** ⌘
□ Other core specifications ⌘
□ Test specifications
□ O&M Specifications

***Other comments:*** ⌘

## How to create CRs using this form:

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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 set of changes *************************

## 4.2.4 IP multimedia Subsystem Service Control Interface (ISC)

The ISC interface is between the Serving CSCF and the service platform(s).

An Application Server (AS) offering value added IM services resides either in the user's home network or in a third party location. The third party could be a network or simply a stand-alone AS.

The Serving-CSCF to AS interface is used to provide services residing in an AS. Two cases were identified:

- Serving-CSCF to an AS in Home Network.
- Serving-CSCF to an AS in External Network (e.g., Third Party or Visited)

Regarding the general provision of services in the IMS, the following statements shall guide the further development.

1. Besides the Cx interface the S-CSCF supports only one standardised protocol for service control, which delegates service execution to an "Application Server".

2. The depicted functional architecture does not propose a specific physical implementation.

3. Scope of the SIP Application Server: the SIP Application Server may host and execute services. It is intended to allow the SIP Application Server to influence and impact the SIP session on behalf of the services and it uses the ISC interface to communicate with the S-CSCF.

4. The S-CSCF shall decide whether an Application Server is required to receive information related to an incoming SIP session request to ensure appropriate service handling.. The decision at the S-CSCF is based on (filter) information received from the HSS (or other sources, e.g. application servers). This filter information is stored and conveyed on a per application server basis for each subscriber. The name(s)/address(es) information of the application server(s) are received from the HSS.

5. The purpose of the IM SSF is to host the CAMEL network features (i.e. trigger detection points, CAMEL Service Switching Finite State Machine, etc) and to interface to CAP.

6. The IM SSF and the CAP interface support legacy services only.

7. Once the IM SSF, OSA SCS or SIP Application Server has been informed of a SIP session request by the S-CSCF, the IM SSF, OSA SCS or SIP Application Server shall ensure that the S-CSCF is made aware of any resulting activity by sending messages to the S-CSCF.

8. From the perspective of the S-CSCF, The "SIP Application server", "OSA service capability server" and "IM-SSF" shall exhibit the same interface behaviour.

9. The application server may contain "service capability interaction manager" (SCIM) functionality and other application servers. The SCIM functionality is an application which performs the role of interaction management. The internal components are represented by the "dotted boxes" inside the SIP application server. The internal structure of the application server is outside the standards. The Sh interface shall have sufficient functionality to enable this scenario.

10. When the name/address of more than one "application server" is transferred from the HSS, the S-CSCF shall contact the "application servers" in the order supplied by the HSS. The response from the first "application server" shall be used as the input to the second "application server". Note that these multiple "application servers" may be any combination of the SIP Application server, OSA service capability server, or IM-SSF types.

11. The S-CSCF does not handle service interaction issues..

12. The S-CSCF does not provide authentication and security functionality for secure direct third party access to the IM subsystem. The OSA framework provides a standardized way for third party secure access to the IM subsystem.

More specifically the following requirements apply to the IMS Service control interface:

1. The ISC interface shall be able to convey charging information.

2. The protocol on the ISC interface shall support the control of timers

3. The protocol on the ISC interface shall allow the S-CSCF to differentiate between session control on Mw, Mm and Mg interfaces and the ISC interface.

The figure below depicts an overall view of how services can be provided.

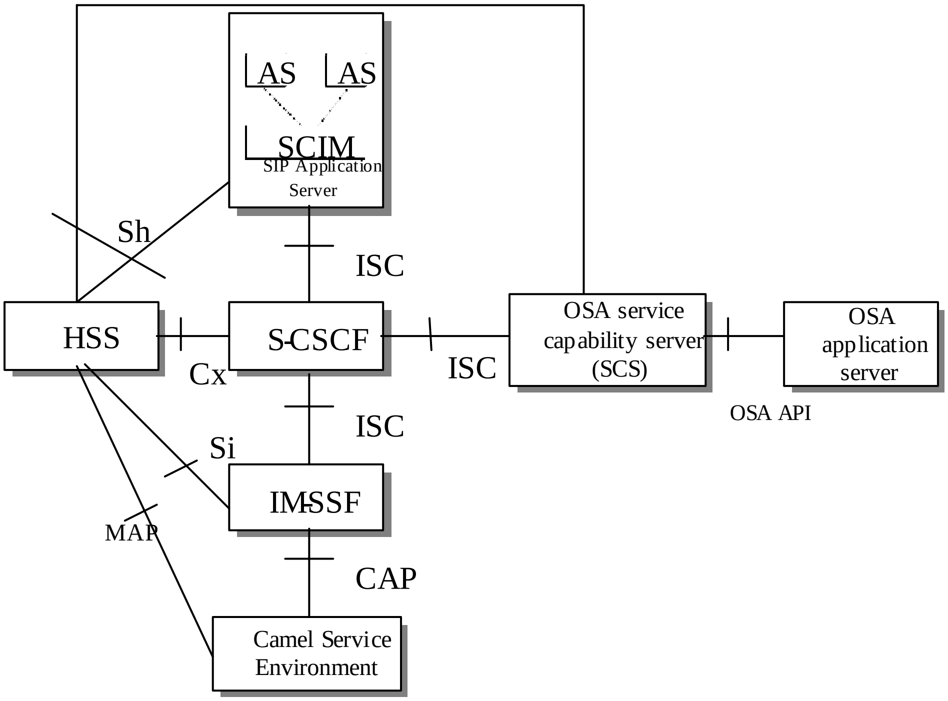


**Figure 4.3: Functional architecture for the provision of service in the IMS**

The protocol to be used on the ISC interface shall be SIP (as defined by RFC 3261 [12], other relevant RFC's, and additional enhancements introduced to support 3GPP´s needs on the Mw, Mm, Mg interfaces). On the ISC interface, extensions to SIP shall be avoided but are not expressly prohibited.

The notion of a "SIP leg" used throughout this specification is identical to the notion of a call leg which is the same as a SIP dialog defined by RFC 3261 [12]. The same SIP leg ~~(as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields)~~ that is received by the S-CSCF on the Mw, Mm and Mg interfaces is sent on the ISC interface. The same SIP leg ~~(as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields)~~ that is received by the S-CSCF on the ISC interface is sent on the Mw, Mm and Mg interfaces.

Concerning the relationship between the SIP legs of the ISC interface and the SIP legs of the Mw, Mm, and Mg interfaces the S-CSCF acts as a SIP proxy, as shown in Figures 4.a-4e below.

Figures 4.3a-4.3e below depict the possible high-level interactions envisioned between the S-CSCF and the Application Server.

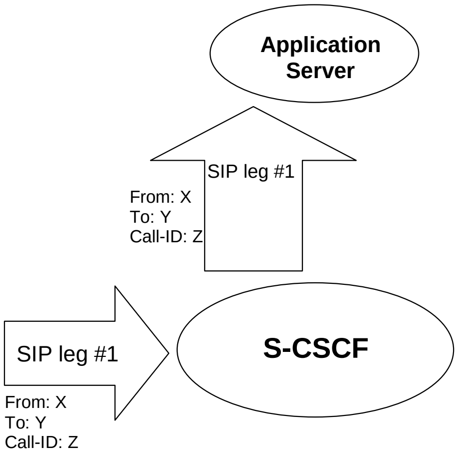


**Figure 4.3a: Application Server acting as terminating UA, or redirect server**

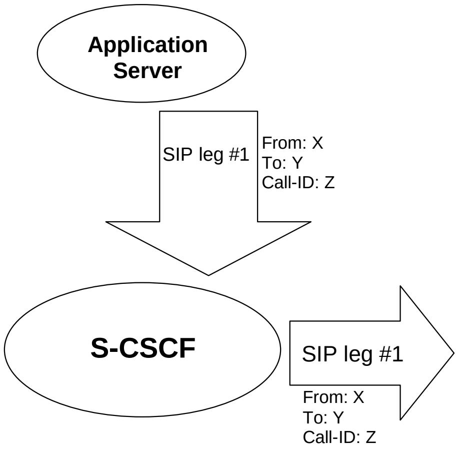


**Figure 4.3b: Application Server acting as originating UA**

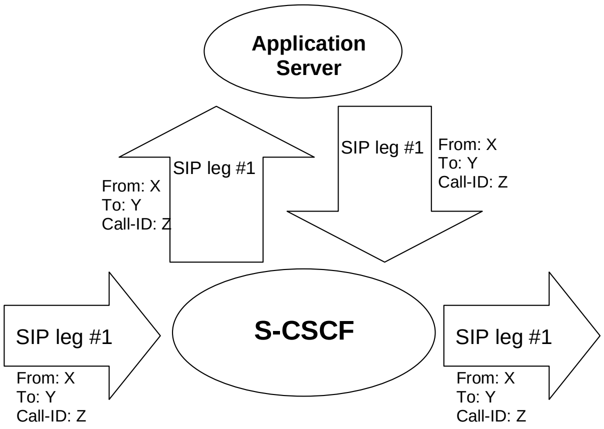


**Figure 4.3c: Application Server acting as a SIP proxy**

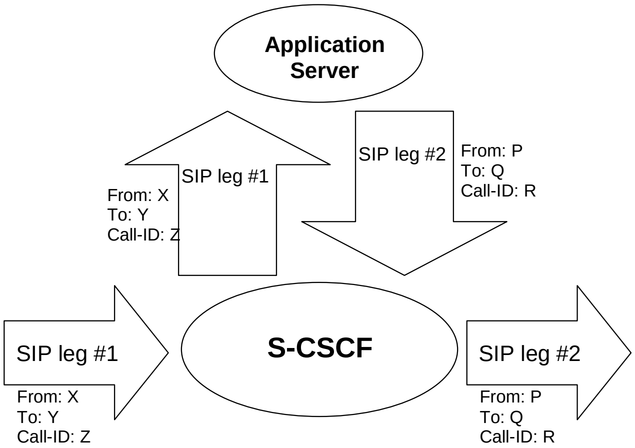


**Figure 4.3d: Application Server performing 3$^{rd}$ party call control**

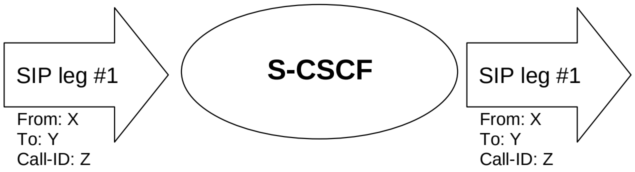
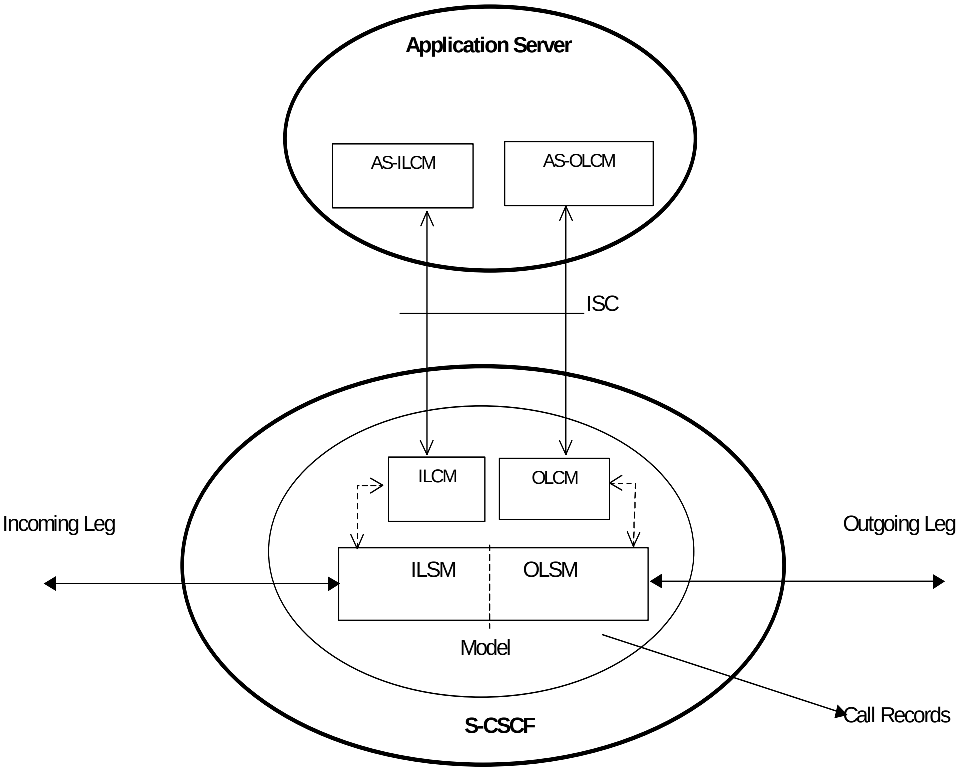


**Figure 4.3e: A SIP leg is passed through the S-CSCF without Application Server involvement**

**************************** Second set of changes ***********************

## 4.2.4b S-CSCF Service Control Model


Application Server
AS-ILCM
AS-OLCM
ISC
ILCM
OLCM
Incoming Leg
Outgoing Leg
ILSM
OLSM
Model
Call Records
S-CSCF

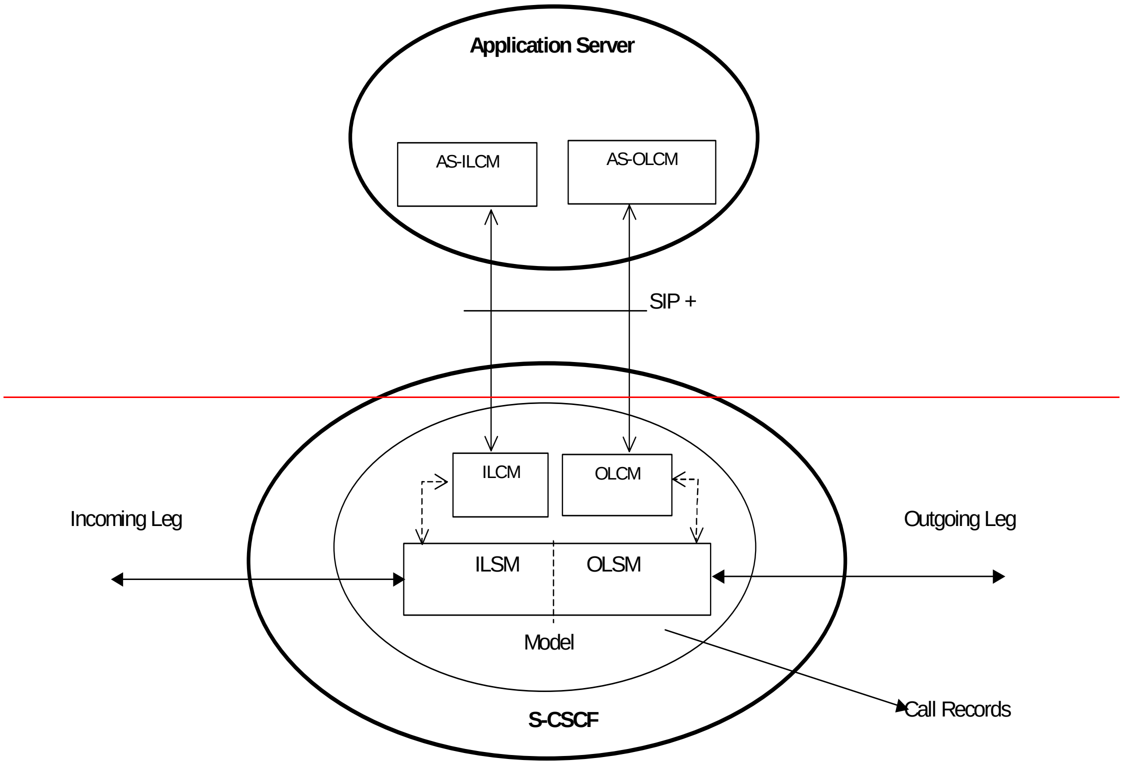


**Figure 4.3f: Service Control Model with Incoming Leg Control and Outgoing Leg Control**

Figure 1 illustrates the relationship between the S-CSCF and AS. It includes a first-level of modelling inside the S-CSCF and inside the AS. To keep the model simple only one incoming leg and one outgoing leg are shown. In practice a session may consist of more than one incoming leg and/or more than one outgoing leg(s), when using User Agents. An AS may create one or more outgoing legs independent of incoming legs. An AS may create one or more outgoing legs even when there are no incoming legs.

While the above figures show session related flows, the service control model can be applied to other SIP transactions such as registration.~~SIP+ is the protocol used between the S-CSCF and the AS.~~ Incoming or outgoing leg information e.g. state information, may be passed between the S-CSCF and AS implicitly or explicitly. Implicitly means that SIP information in transit carries information about the state of the session (e.g. an INVITE message received at the S-CSCF on an incoming leg may be sent to the AS with no changes or with some additional information). Explicitly means that SIP information is generated, e.g. to transfer state change information from an S-CSCF to an AS in circumstances where there is no ongoing SIP transaction that can be used. It is a matter for Stage 3 design to determine when to use implicit or explicit mechanisms and to determine what extensions to SIP are necessary.

The internal model of the S-CSCF(shown in Figure 1) may sometimes exhibit proxy server like behaviour either by passing the requests to the Application Server or by passing the requests out of the system. A Proxy server may maintain session state or not. The S-CSCF may sometimes exhibit User Agent like behaviour. Some Applications require state to be maintained in the S-CSCF. Their exact behaviour depends on the SIP messages being handled, on their context, and on S-CSCF capabilities needed to support the services. It is a matter for Stage 3 design to determine the more detailed modelling in the S-CSCF.

The internal model of the AS (shown in Figure 1) may exhibit User Agent like behaviour. The exact behaviour depends on the SIP messages being handled and on their context. Detailed Stage 3 modelling for the AS is not required.

The definitions used in the model are:

**Combined ILSM OLSM – Incoming/outgoing Leg State Model:** Models the behaviour of an S-CSCF for handling SIP messages on incoming and outgoing session legs. The Combined I/OLSM shall be able to store session state information. It may act on each leg independently, acting as a SIP Proxy, Redirect Server or User Agent dependant on the information received in the SIP request, the filter conditions specified or the state of the session.

It shall be possible to split the application handling on each leg and treat each endpoint differently.

**ILCM - Incoming Leg Control Model:** Models the behaviour of an S-CSCF for handling SIP information sent to and received from an AS for an incoming session leg. The ILCM shall store transaction state information

**OLCM - Outgoing Leg Control Model:** Models the behaviour of an S-CSCF for handling SIP information received from and sent to an AS for an outgoing session leg. The OLCM shall store transaction state information.

**AS-ILCM - Application Server Incoming Leg Control Model:** Models AS behaviour for handling SIP information for an incoming leg. The AS-ILCM shall store Transaction State, and may optionally store Session State depending on the specific service being executed.

**AS-OLCM - Application Server Outgoing Leg Control Model:** Models AS behaviour for handling SIP information for an outgoing leg. The AS-OLCM shall store Transaction State, and may optionally store Session State depending on the specific service being executed.

**3GPP TSG-SA2 Meeting #26**
**Toronto Canada,19 –23 August , 2002**

***Tdoc S2-~~022543~~022644***

CR-Form-v7

# CHANGE REQUEST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⌘ | **23.228** | **CR** | **202** | ⌘ **rev** | **~~-~~1** | ⌘ Current version: | **5.5.0** ⌘ |

*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:*** | ⌘ | Clarification on filter criteria | | |
| ***Source:*** | ⌘ | NEC Corporation | | |
| ***Work item code:*** | ⌘ | IMS-CCR | ***Date:*** ⌘ | 22/8/2002 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | Rel-5 |

*Use one of the following categories:*
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| *R99* | *(Release 1999)* |
| *Rel-4* | *(Release 4)* |
| *Rel-5* | *(Release 5)* |
| *Rel-6* | *(Release 6)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | The current text in 4.2.4 causes misunderstanding in respect of choice of application servers. The selection of AS from the results of previous ISC interface between S-CSCF and AS is not supported in Rel 5 |
| ***Summary of change:*** | ⌘ | In 4.2.4, it is deleted that selection of AS is also based on other sources,etc. |
| ***Consequences if not approved:*** | ⌘ | Selection of AS may be implemented wrongly in Rel 5. |

| | | |
|---|---|---|
| ***Clauses affected:*** | ⌘ | 4.2.4a |

***Other specs affected:*** ⌘

| Y | N | | |
|---|---|---|---|
| | X | Other core specifications | ⌘ |
| | X | Test specifications | |
| | X | O&M Specifications | |

***Other comments:*** ⌘

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## Start of change

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The ISC interface is between the Serving CSCF and the service platform(s).

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More specifically the following requirements apply to the IMS Service control interface:

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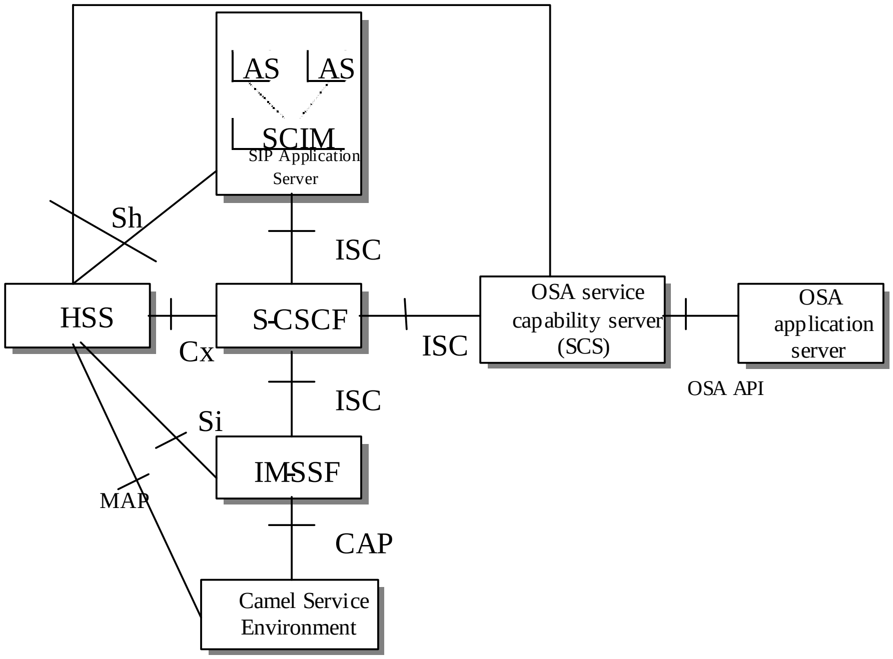

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The protocol to be used on the ISC interface shall be SIP (as defined by RFC 3261 [12], other relevant RFC's, and additional enhancements introduced to support 3GPP´s needs on the Mw, Mm, Mg interfaces). On the ISC interface, extensions to SIP shall be avoided but are not expressly prohibited.

The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the Mw, Mm and Mg interfaces is sent on the ISC interface. The same SIP leg (as defined by the "Call-id", "To" and "From" information fields, with the associated "tag" information fields) that is received by the S-CSCF on the ISC interface is sent on the Mw, Mm and Mg interfaces.

End of change