

CHANGE REQUEST

24.228 CR 067 # rev **1** # Current version: **5.1.0**

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:	# Remaining REGISTER and SUBSCRIBE flow updates		
Source:	# Lucent Technologies, Ericsson, dynamicsoft, Nokia, Nortel		
Work item code:	# IMS-CCR	Date:	# 06/08/2002
Category:	# F	Release:	# Rel-5
	Use <u>one</u> of the following categories:		Use <u>one</u> 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 be found in 3GPP TR 21.900 .		Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	# The vast majority of the clauses in 24.228 have been revised to be consistent in their usage of route, via, request-uri, etc. The flows involving SUBSCRIBE have not yet been handled in this manner, and a large number of changes are therefore required. In addition, there has been some alignment with RFC 3265 and with the usage of the P-Asserted-Identity header.
Summary of change:	# <ul style="list-style-type: none"> • Insertion of missing Subscription-State header in NOTIFY requests. • Correction of Record-Route header usage in SUBSCRIBE method. For SUBSCRIBE request sent from P-CSCF to S-CSCF, the P-CSCF and S-CSCF are both acting as User Agents, and therefore do not insert their addresses in the Record-Route header. For SUBSCRIBE sent from UE to S-CSCF, the S-CSCF is acting as a User Agent, and therefore does not insert its address in the Record-Route header. Branch tags have been removed from all Record-Route headers, and the Ir parameter included. As the S-CSCF address is not included in any of these headers, this means that for the hiding flows, this header is not tokenized for these flows. • Alignment of UE generated SUBSCRIBE flows with those of a UE generated INVITE flow (e.g. 7.2.2) as these are both following similar procedures in 24.229 as initial requests of a dialog. This also involves inclusion of information storage tables at P-CSCF and S-CSCF as shown for those flows. • For P-CSCF generated dialogs (SUBSCRIBE request), insertion of new Call-ID value, and in 6.8-2 and 16.8-2 replacement of Call-ID with correct value used in other flows. • Inclusion of P-Asserted-Identity header and Privacy header in SUBSCRIBE flows and associated response flows in place of Remote-Party-ID header, and in alignment with clause 7.2.2. • Removal of Remote-Party-ID header from all NOTIFY requests, as this is a subsequent message in a dialog, and therefore should not be included even

- as P-Asserted-Identity.
- Correction of Via header contents, and application of correct format for tokenized addresses.
- Insertion of word "request" after REGISTER, SUBSCRIBE, NOTIFY.
- Formatting of all response identifiers as dd (xxxx) response.
- "Public-id" converted to "public user identity".
- "message information" converted to "message flows" for consistency between clauses.
- Inclusion of definite and indefinite articles as appropriate.
- Separation of some headers onto separate rows where the intervening paragraph break has been lost.
- Some instances of "user" changed to "UE".
- "de-register" changed to "deregister" for consistency within the document.
- Removal of normative terms, i.e. "shall", from clauses that are essentially examples.
- Correction of addresses in the figures, i.e. "icscf1_1" becomes "icscf1_p".
- Removal of excessive capitalisation.
- Addition of reference number after references to 3GPP 29.228.
- For consistency with the UE generated SUBSCRIBE requests, the P-Asserted-Identity header has also been added to the P-CSCF generated SUBSCRIBE requests. While this conveys no additional value, it does keep the usage of these headers consistent across all methods. This will ultimately need to be reflected in a further change to 24.229.
- The registration event package name is renamed to "reg" instead of "registration-status", according to CR 195 to 24.229.
- The Expires header, as per RFC 3265, shall not be present in NOTIFY requests. This information should however be present in the Subscription-State header when this header indicates active.

Consequences if not approved: ☼ Examples flows are incorrect, and header usage is inconsistent with that show for other flows.

Clauses affected: ☼ 6.5, 6.6, 6.7.1, 6.7.2, 6.7.3, 6.8, 6.9.2, 6.9.3, 16.5, 16.6, 16.8, 16.9.1

	Y	N		
Other specs	X		Other core specifications	☼ P-Asserted-Identity usage in P-CSCF generated SUBSCRIBE request needs to be reflected in a 24.229 CR yet to be produced.
affected:		X	Test specifications	
		X	O&M Specifications	

Other comments: ☼

How to create CRs using this form:

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

- 1) Fill out the above form. The symbols above marked ☼ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.5 UE subscription for the registration state event package

This subclause describes the subscription procedure for the registration state event , whereby the UE requests to be notified by the S-CSCF when the event has occurred. This is done using the information structure as indicated in 3GPP TS 24.229 [16].

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

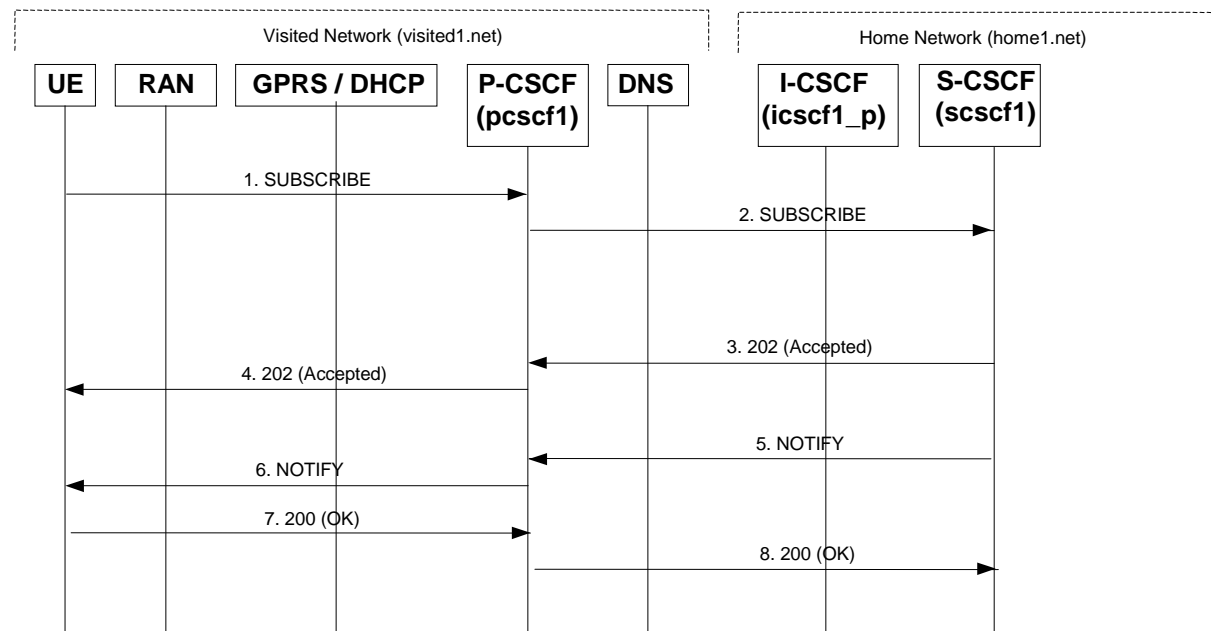
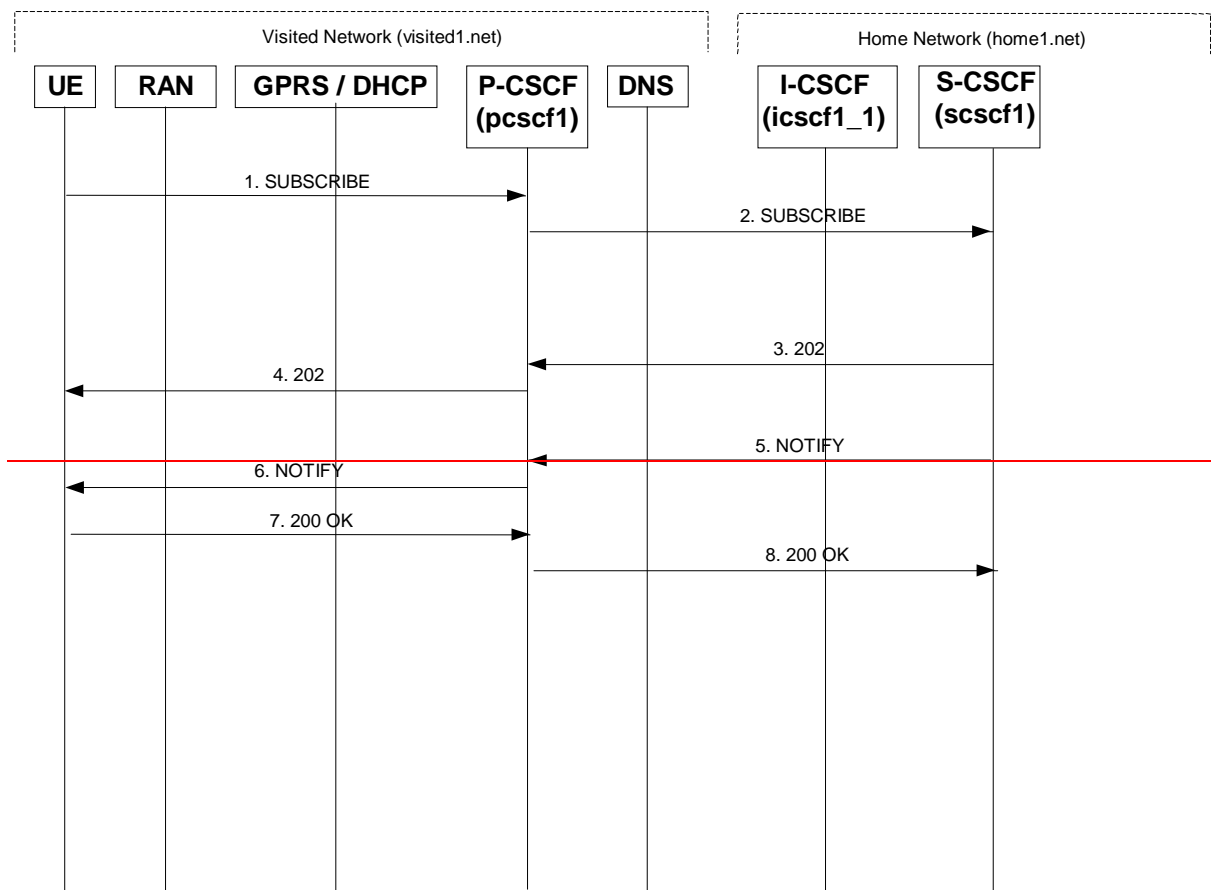


Figure 6.5-1: UE subscription for the registration state event package (without I-CSCF providing configuration independence)

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

The UE sends [the SUBSCRIBE request](#) for the [registration-state-reg](#) event package.

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

```

SUBSCRIBE sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy: none
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 SUBSCRIBE
Event: registration-staterreg
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Content-Length: 0
    
```

From: [the user does not require privacy, the From header contains the value requested by the user. This field is populated with logical representation \(FQDN\) for the entity sending the SUBSCRIBE.](#)

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

P-Asserted-Identity: [the user provides a hint about the identity to be used for this session.](#)

Event: This field is populated with the value '~~registration-stater~~reg' to specify the use of the registration state package.

Accept: This field is populated with the value 'application/cpim-pidf+xml'.

[Upon receiving the SUBSCRIBE request, the P-CSCF stores the following information about this dialog, for use in possible error recovery actions - see example in table 6.5-1b.](#)

Table 6.5-1b: Storage of information at P-CSCF

```

Request-URI: sip:user1_public1@home1.net
From: sip:user1_public1@home1.net;tag=31415
To: sip:user1_public1@home1.net
Call-ID: b89rjhnedlrfjflslj40a222
Cseq(2dest): 61 SUBSCRIBE
Cseq(2orig): none
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
    
```

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

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

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

```

SUBSCRIBE sip:sescf1.home1.netsip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP pcsf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:user1_public1@scscf1.home1.net;lr
Record-Route: sip:431h23.1@pcscf1.home1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
    
```

Route: [contains the elements from the Path header from registration. The Route: header is populated with the Request URI received from the UE in the SUBSCRIBE.](#)

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

Upon receiving the INVITE, the S-CSCF stores the following information about this session, for use in possible error recovery actions - see example in table 6.5-2b.

Table 6.5-2b: Storage of information at S-CSCF

```
Request-URI: sip:scscf1.home1.net;user1_public1@home1.net
From: sip:user1_public1@home1.net;tag=31415
To: sip:user1_public1@home1.net
Call-ID: b89rjhnedlrfjflslj40a222
Cseq(2dest): 61 SUBSCRIBE
Cseq(2orig): none
Route(2orig): sip:pcscf1.home1.net
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

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

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

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

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

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: scscf1.home1.net, sip:pcscf1.home1.net;lr
Remote-Party-IDP-Asserted-Identity: "Registrar" <sip:registrar@scscf1.home1.net>
Privacy: none
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Event:
Expires:
Contact: sip:scscf1.home1.net
Content-Length:
```

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

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

P-CSCF sends the response to UE.

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

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route:
Remote-Party-IDP-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Contact:
Content-Length:
```

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

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

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

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

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

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

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7sip:pcscf1.home1.net;lr
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq: 42 NOTIFY
Subscription-State: active;expires=7200
Expires:
Event: registration-state;reg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf">

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

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

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

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in the NOTIFY request that carries the subscriber's registration state is formed as indicated in 3GPP TS 24.229 [16].

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

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

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

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 69
Remote-Party-ID:
From:
To:
Call-ID:
CSeq:
Subscription-State:
Expires:
Event:
Content-Type:
Contact:
Content-Length:

```

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

The UE generates a 200 (OK) response to the NOTIFY [request](#).

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

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

P-CSCF forwards the 200 (OK) to [the](#) S-CSCF.

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

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

This section describes the subscription procedure for the network initiated deregistration event, whereby the P-CSCF requests to be notified by the S-CSCF when the event has occurred. This is done using the ['registration-state~~reg~~'](#) package as described in 3GPP TS 24.229 [16].

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

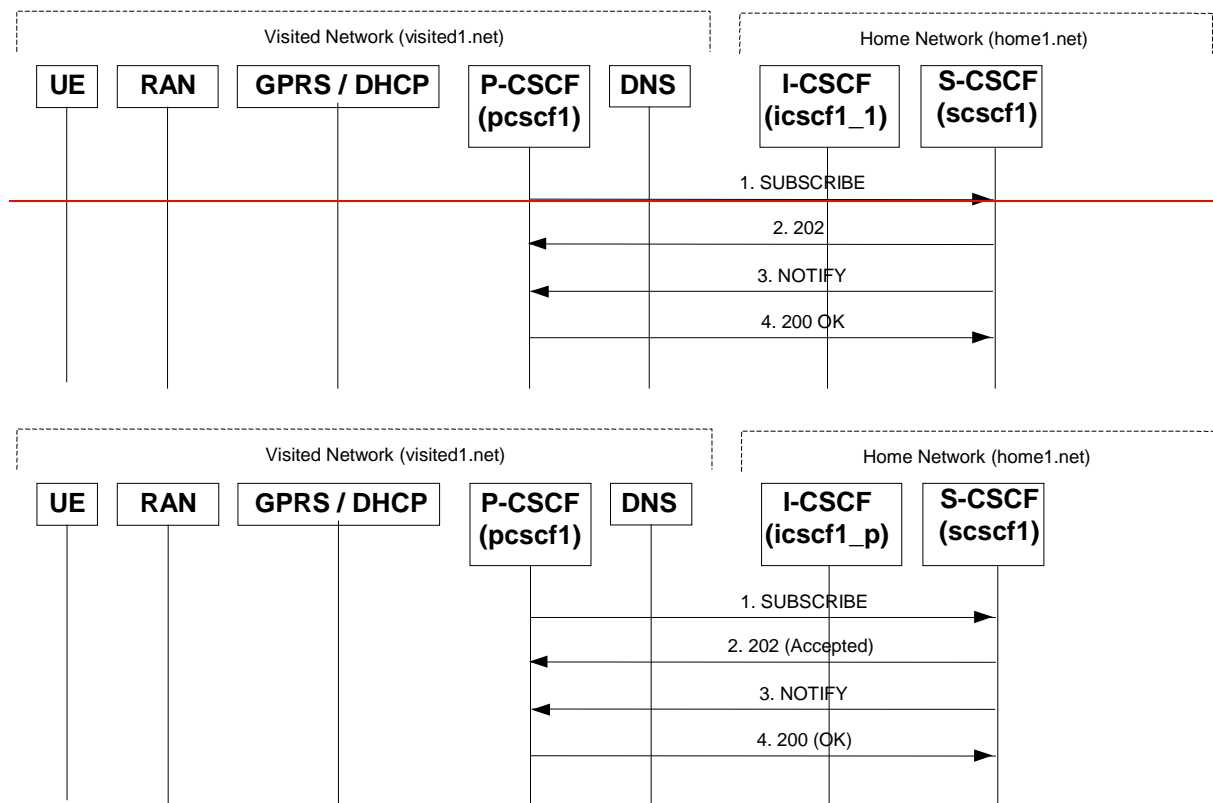


Figure 6.6-1: P-CSCF subscription for the registration state event package (without I-CSCF providing configuration independence)

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

The P-CSCF sends [the SUBSCRIBE request](#) for the [registration-state-reg](#) event package.

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

```
SUBSCRIBE sesef1.home1.net:sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 70
P-Asserted-Identity: <sip:pcscf1@visited1.net><sip:pcscf1.visited1.net>
Privacy: none
From: <sip:pcscf1.visited1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: dre36d2v32gnlgiomm72445223456789@pcscf1.visited1.net
CSeq: 61 SUBSCRIBE
Event: registration-state-reg
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:pcscf1.visited1.net>
Content-Length: 0
```

- From:** This header is populated with the SIP URI that identifies the P-CSCF.
- Contact:** This is where the NOTIFY requests for this subscription will be sent. It consists of the SIP URL-escaped public user identity at the P-CSCF.
- Event:** This field [shall be is](#) set to the value '[registration-state-reg](#)' to specify the use of the [registration-state-reg](#) package.
- Accept:** This field [shall be is](#) set to the value 'application/cpim-pidf+xml'.

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

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

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

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

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1,SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Remote-Party-ID: "Registrar" <sip:registrar.home1.net>
P-Asserted-Identity: "Registrar" <sip:registrar@scscf1.home1.net>
Privacy: none
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Contact: sip:scscf1.home1.net
Event:
Expires:
Content-Length:
```

Expires: If value of the Expires header in SUBSCRIBE request is different from the one received in REGISTER method, then the value of Expires header in [the 202 \(Accepted\) response](#) is set to match the value of Expires header in REGISTER method.

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

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

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

```
NOTIFY sip:pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Remote-Party-ID: "Registrar" <sip:user1_public1@registrar.home1.net>
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@pcscf1.visited1.net>;tag=31415
Call-ID: dre36d2v32gnlgiomm72445223456789@pcscf1.visited1.net
CSeq: 42 NOTIFY
Subscription-State: active;expires=7200
Expires: 7200
Event: registration-statereg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf">

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

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in the NOTIFY request that carries the subscriber's registration state is formed as indicated in 3GPP TS 24.229 [16].

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

P-CSCF forwards the 200 (OK) [response](#) to [the](#) S-CSCF.

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

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Type:
Content-Length: 0
```

6.7 Notifying of the network-initiated deregistration event

6.7.1 Network-Initiated Deregistration event occurs in the S-CSCF

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

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

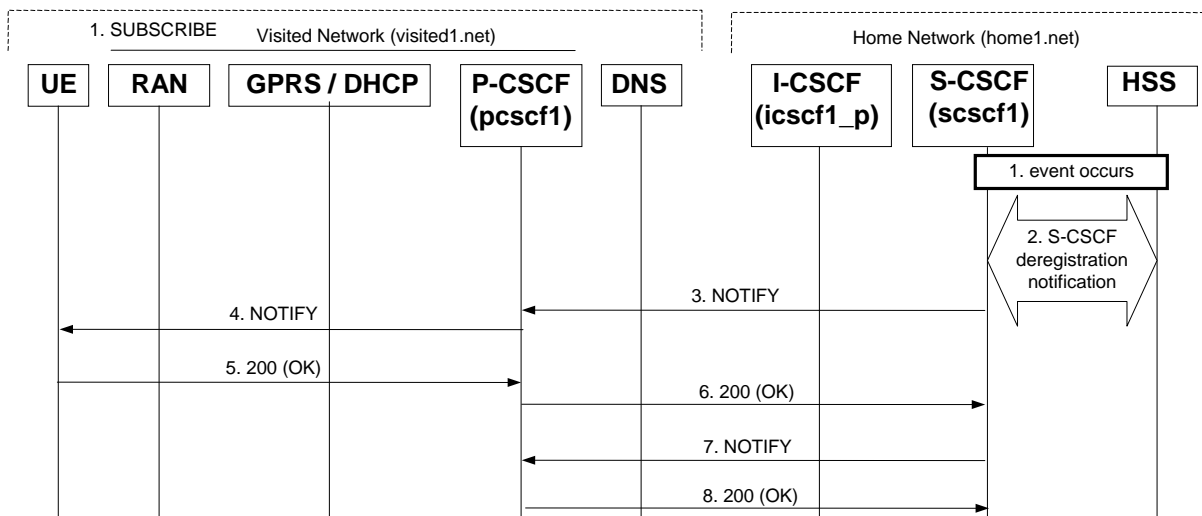
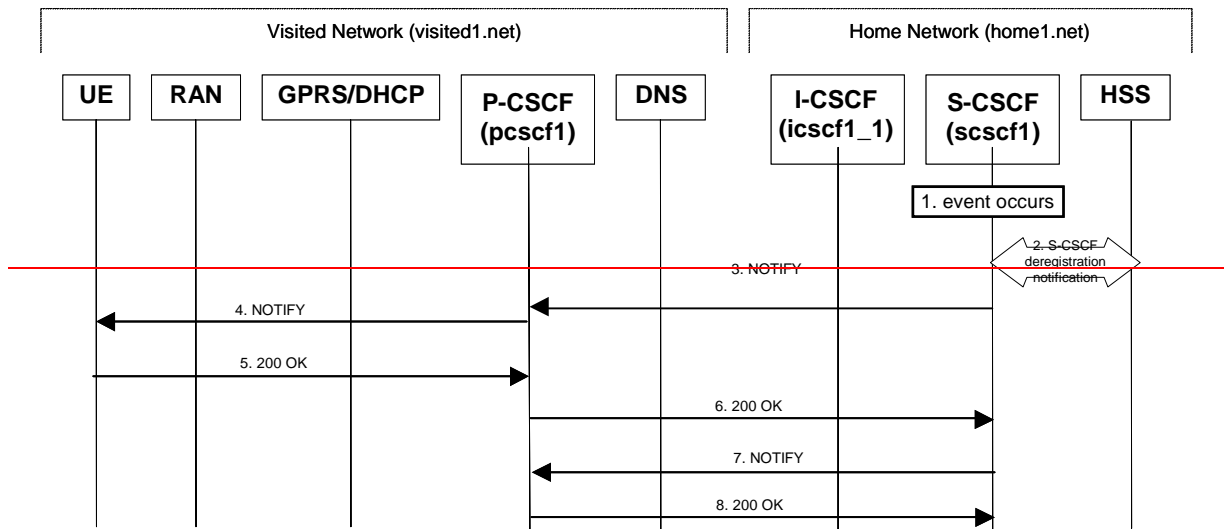


Figure 6.7.1-1: Network Initiated Deregistration event occurs in the S-CSCF

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

2. S-CSCF deregistration notification

When the Network Initiated Deregistration Event occurs in the S-CSCF, the S-CSCF informs the HSS that the user is no longer registered. The S-CSCF either notifies the HSS to clear or requests to keep its location information for that subscriber. The HSS then either clears or keeps the S-CSCF name for that subscriber according to request. In both cases the state of the subscriber identity is stored as unregistered in the HSS and the S-CSCF. The HSS acknowledges the request.

For detailed message flows see 3GPP TS 29.228 [11].

3 SIP NOTIFY [request](#) (S-CSCF to P-CSCF) - see example in table 6.7.1-3

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

Table 6.7.1-3: SIP NOTIFY [request](#) (S-CSCF to P-CSCF)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:pesef1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7sip:pcscf1.visited1.net;lr
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID: b89rjhmedlrfjflslj40a222
CSeq: 43 NOTIFY
Subscription-State: activeterminated
Expires: 7200
Event: registration-statereg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">

  <tuple name="sip:user1_public1@home1.net">
    <status><basic>closed</basic>
  </tuple>
  <note>
    reason-phrase: "You have been deregistered from the network, please register again";
    registrar: registrar.home1.net
  </note>
</status>
</tuple>

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

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

</presence>
```

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

P-CSCF forwards the NOTIFY request to the UE.

Table 6.7.1-4: SIP NOTIFY [request](#) (P-CSCF to UE)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 69
From:
To:
Call-ID:
CSeq:
Subscription-State:
Expires:
Event:
Content-Type:
Contact:
Content-Length:

```

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

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

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

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

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

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

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

```

NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visisted1.net>;tag=31415
Call-ID: dre36d2v32gnlgiomm72445+234567890@[5555+::aaa+bbb+ccc+ddd]
CSeq: 43 NOTIFY
Subscription-State: activeterminated
Expires: 7200
Event: registration-statereg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">

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

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

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

</presence>

```

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

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6.7.2 Network-~~Initiated~~initiated ~~d~~Deregistration event occurs in the HSS

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

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

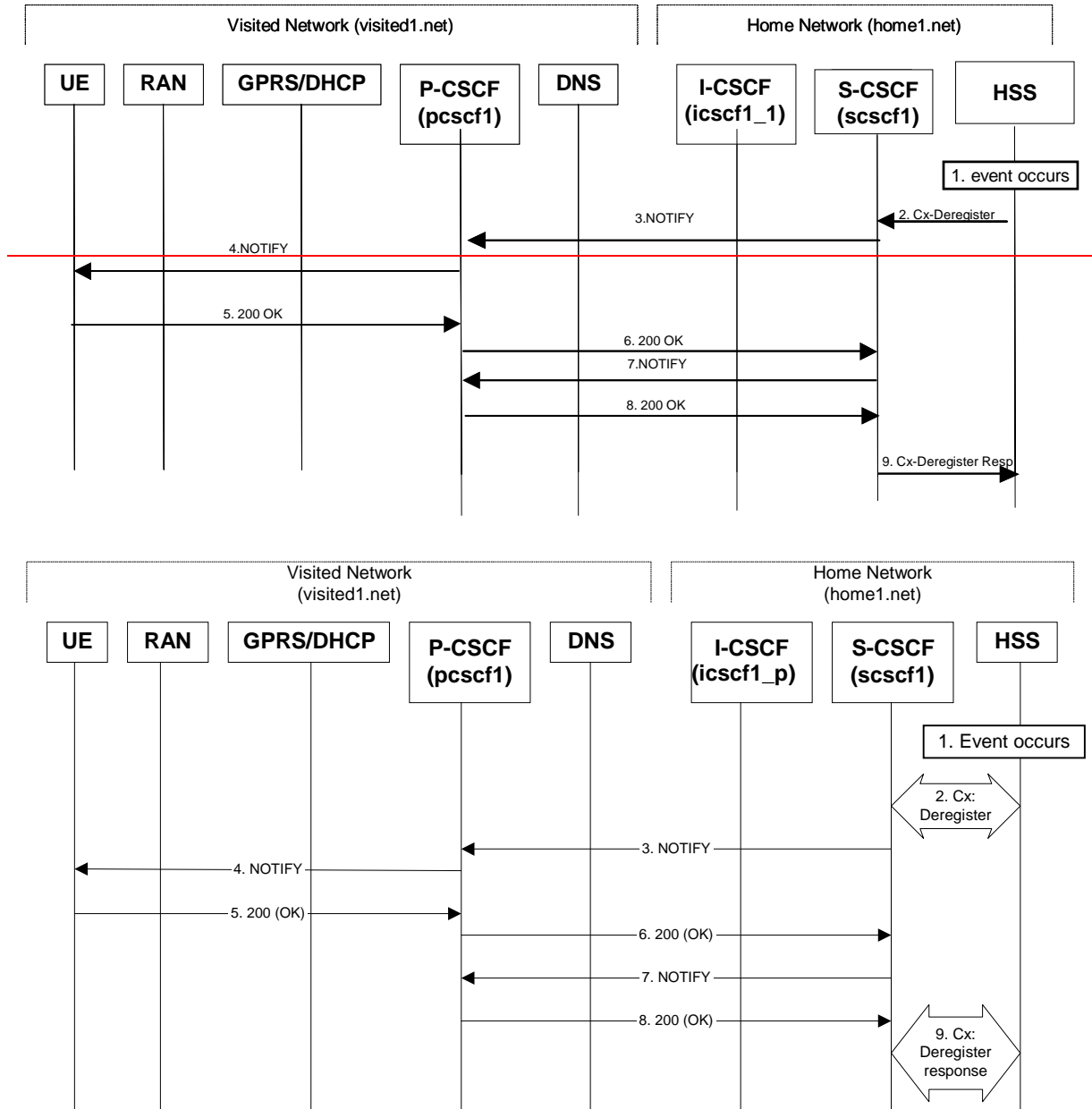


Figure 6.7.2-1: Network-Initiated Deregistration event occurs in the HSS

1. Network-Initiated Deregistration event occurs in the HSS
2. Cx-Deregister

HSS initiates the de-registration, sending a Cx-Deregister (subscriber identity). For detailed message information flows see 3GPP TS 29.228 [11].

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

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

Table 6.7.2-3: SIP NOTIFY [request](#) (S-CSCF to P-CSCF)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: SIP/2.0/UDP-[5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnaashde7sip:pcscf1.visited1.net;lr
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 43 NOTIFY
Subscription-State: activeterminated
Expires: 7200
Event: registration-statereg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">

  <tuple name="sip:user1_public1@home1.net">
    <status><basic>closed</basic>
  </tuple>
  <note>
    reason-phrase: "You have been deregistered from the network, please register again";
    registrar: registrar.home1.net
  </note>
</status>
</tuple>

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

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

</presence>

```

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

P-CSCF forwards the NOTIFY [response-request](#) to the UE.

Table 6.7.2-4: SIP NOTIFY [request](#) (P-CSCF to UE)

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 69
From:
To:
Call-ID:
CSeq:
Subscription-State:
Expires:
Event:
Content-Type:
Contact:
Content-Length:

```

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


```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

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

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

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

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

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

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

```
NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visited1.net>;tag=31415
Call-ID: dre36d2v32gnlgiiomm724451234567890@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Subscription-State: active;expires=7200
Expires: 7200
Event: registration-staterereg
Contact: sip:scscf1.home1.net
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf">
  <tuple name="sip:user1_public1@home1.net">
    <status><basic>closed</basic>
    <note>
      reason-phrase: "This public ID has been de-registered by the network";
      registrar: registrar.home1.net
    </note>
  </status>
</tuple>

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

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

</presence>
```

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

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

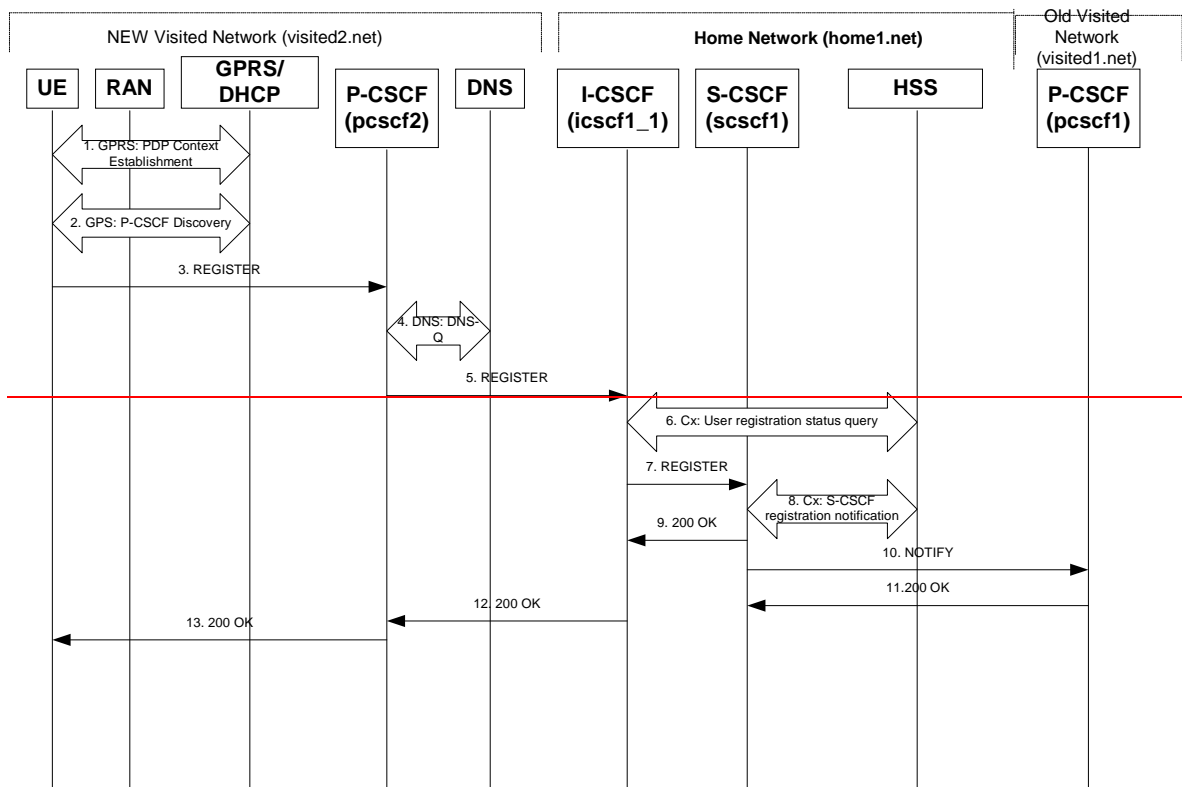
```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

9. Cx-Deregister Resp

After receiving the 200 (OK) response from the P-CSCF, the S-CSCF sends Cx-Deregister Resp to the HSS. For detailed message [information-flows](#) see 3GPP TS 29.228 [11].

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

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



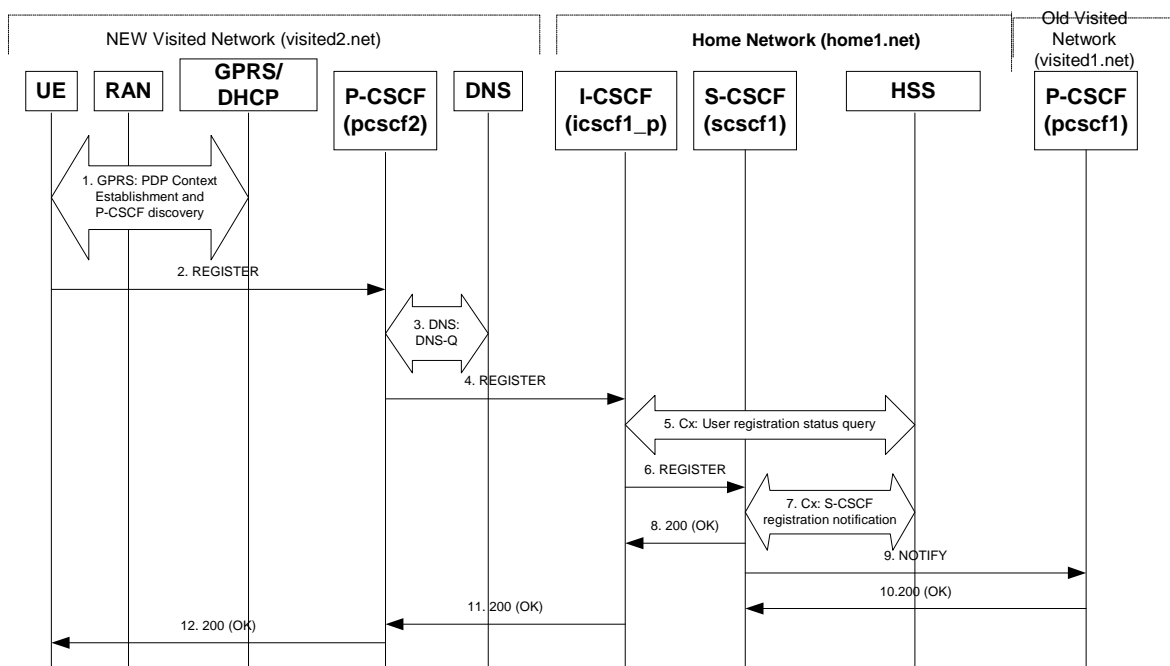


Figure 6.7.3-1: Network-Initiated De-registration upon UE roaming without De-registration

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

6.5. Cx: User Registration Status Query

The I-CSCF shall send the Cx-Query signalling flow to the HSS (Visited Network Identifier, subscriber identity, home domain name,). Because user has not de-registered with its previous network, so that HSS finds a S-CSCF assigned for that user and treats this as a re-registration procedure. Therefore, the HSS returns the S-CSCF name to the I-CSCF. For detailed message flows see 3GPP TS 29.228 [11].

For the parameters in the REGISTER request (flow 6) which need to be sent to HSS, see table 6.2-54a.

Table 6.3-15a 6.3-4a provides the parameters in the REGISTER request (flow 7) message which are obtained from the information sent back from the HSS.

7.6. REGISTER request (I-CSCF to S-CSCF)

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

7.8. Cx-S-CSCF Registration Notification

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

9.10. NOTIFY request (S-CSCF to Old P-CSCF) - see example in table 6.7.3-910

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

Table 6.7.3-910: SIP NOTIFY request (S-CSCF to Old P-CSCF)

```

NOTIFY sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:pcscf1.visisted1.net>;tag=31415
Call-ID: dre36d2v32gnlgiomm724451234567890@[5555:+aaa+bbb+ccc+ddd]
CSeq: 43 NOTIFY
Subscription-State: activeterminated
Expires: 7200
Event: registration-statereg
Content-Type: -application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">
  <tuple name="sip:user1_public1@home1.net">
    <status><basic>closed</basic>
    <note>
      reason-phrase: "This public ID has been de-registered by the network";
      registrar: registrar.home1.net
    </note>
  </status>
</tuple>

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

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

</presence>

```

104. SIP 200 (OK) response (Old P-CSCF to S-CSCF) - see example in table 6.7.3-104

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

Table 6.7.3-104: SIP 200 (OK) response (Old P-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

6.8 Network initiated re-authentication

This subclause describes the notification of a ~~user~~ UE that occurs when the S-CSCF assigned to that user requests re-authentication.

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

After this procedure the user's UE might automatically initiate re-registration procedures. If the user fails to re-register, the public user identity for which re-authentication is requested, the public user identity may be de-registered by S-CSCF.

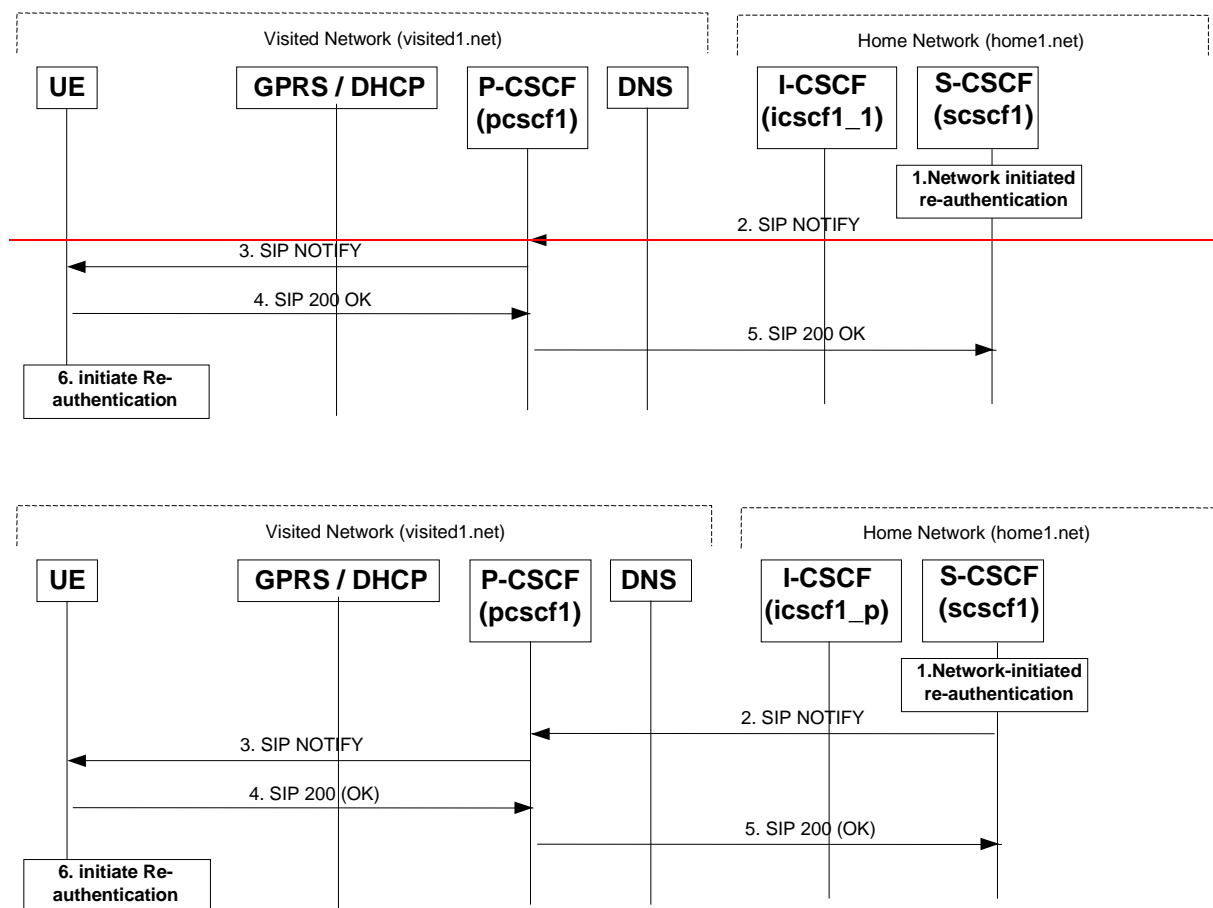


Figure 6.8-1: S-CSCF informs UE about network-initiated re-authentication event (without I-CSCF providing configuration independence)

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

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

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

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

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

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

```

NOTIFY sip:pcscf1.visited1.net:sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: SIP/2.0/UDP-[5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnaahds7sip:pcscf1.visited1.net;lr
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 43 NOTIFY
Subscription-State: active;expires=7200
Expires: 3600
Event: registration-staterereg
Content-Type: application/cpim-pidf+xml
Contact: sip:scscf1.home1.net
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:"
  xmlns:registration="urn:ietf:params:xml:ns:cpim-pidf:registration">

  <tuple name="sip:user1_public1@home1.net">
    <status>
      <basic>open</basic>
      <registration>re-authenticate</registration>
    </status>
  </tuple>
</presence>

```

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in NOTIFY [request](#) that carries the subscriber's registration state is formed as indicated in 3GPP TS 24.229 [16].

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

[The P-CSCF](#) forwards the NOTIFY [message-request](#) to UE.

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

```

NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 69
Remote-Party-ID:
From:
To:
Call-ID:
CSeq:
Subscription-State:
Expires:
Event:
Content-Type:
Contact:
Content-Length:

```

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

The UE generates a 200 (OK) response to the NOTIFY [request](#).

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

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

P-CSCF forwards the 200 (OK) response to the S-CSCF.

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

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

6. Re-authentication (UE)

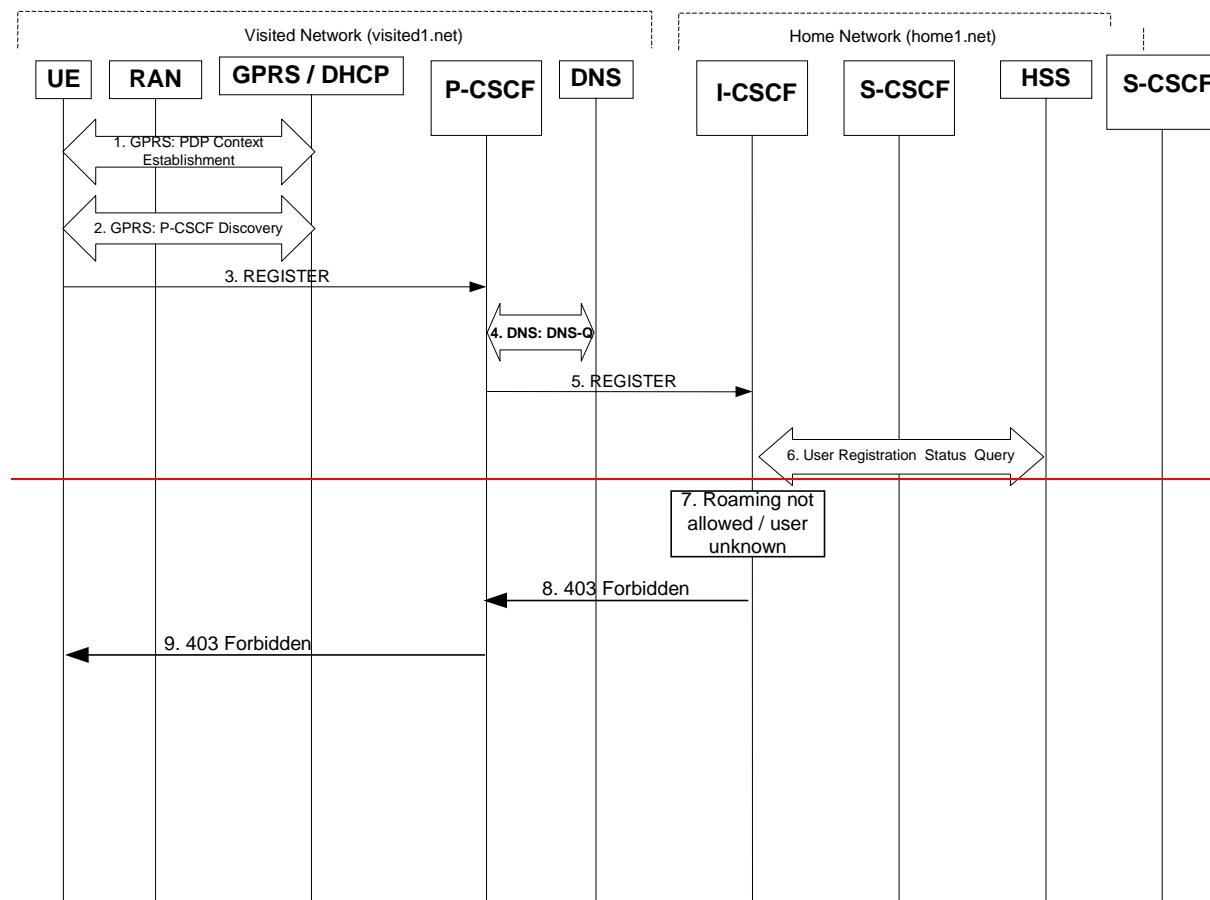
The UE shall now initiate re-authentication procedures.

6.9 Registration error conditions

6.9.1 Reregistration - failure of reregistration

See subclause 16.9.1.

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



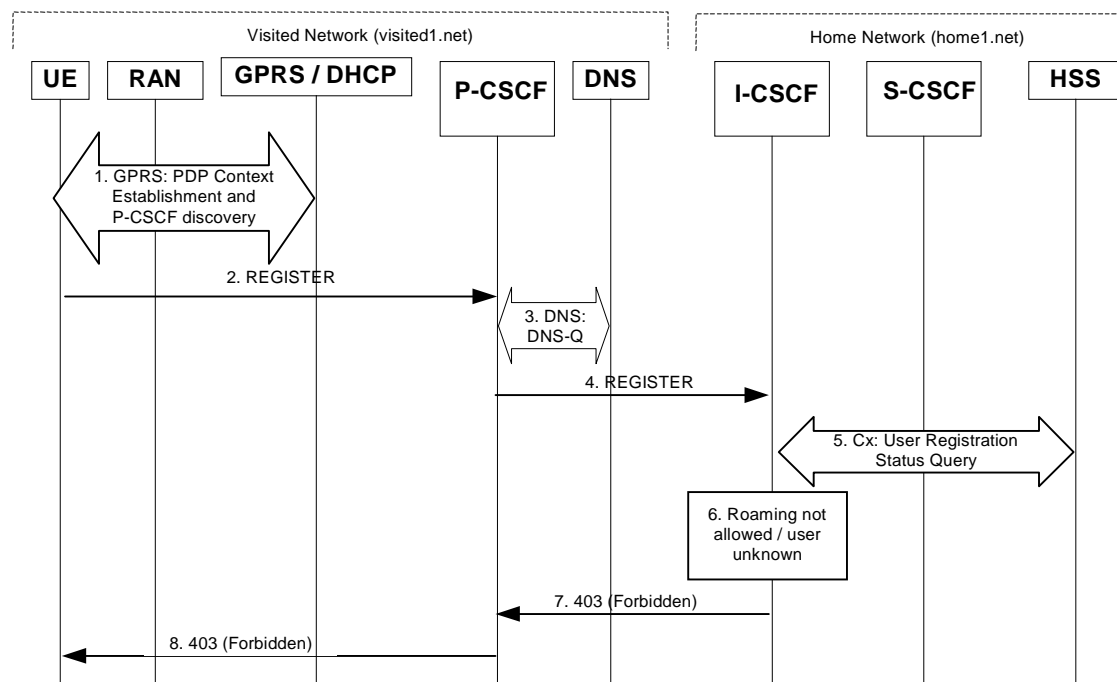


Figure 6.9.2-1: Registration failure: User not registered, user not allowed to roam

The first ~~six~~ five steps are similar with the regular Registration signalling flows described in subclause ~~4~~ 6.2.

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

7.6. Roaming not allowed / User unknown

The information received as a response to the Cx-Query may indicate that "Roaming is not allowed" for the subscriber from the visited1.net network. In this case I-CSCF needs to send a 403 (Forbidden) response back to the UE. I-CSCF will insert a warning header in the response, indicating to the UE the reason of refusing the Registration request. Warning header will contain the name of the network inserting the warning header (warn-agent = home1.net) and in addition it may contain a warn-text. The warn-code inserted into the Warning header is 399.

When the information received as a response to the Cx-Query indicates that the subscriber is unknown to the network or the subscriber does not have a valid subscription, the I-CSCF needs to send a 403 (Forbidden) response back to the UE. I-CSCF will insert a warning header in the response, indicating to the UE the reason of refusing the Registration request. Warning header will contain the name of the network inserting the warning header (warn-agent = home1.net) and in addition it may contain a warn-text. The warn-code inserted into the Warning header is 399.

7.8. 403 (Forbidden) response (I-CSCF to P-CSCF) - see example in table 6.9.2-78

Table 6.9.2-78: 403 (Forbidden) response (I-CSCF to P-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP pscsf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Warning: 399 home1.net "Roaming not allowed from this network"
From:
To:
Call-ID:
Cseq:
Content-Length: 0
```

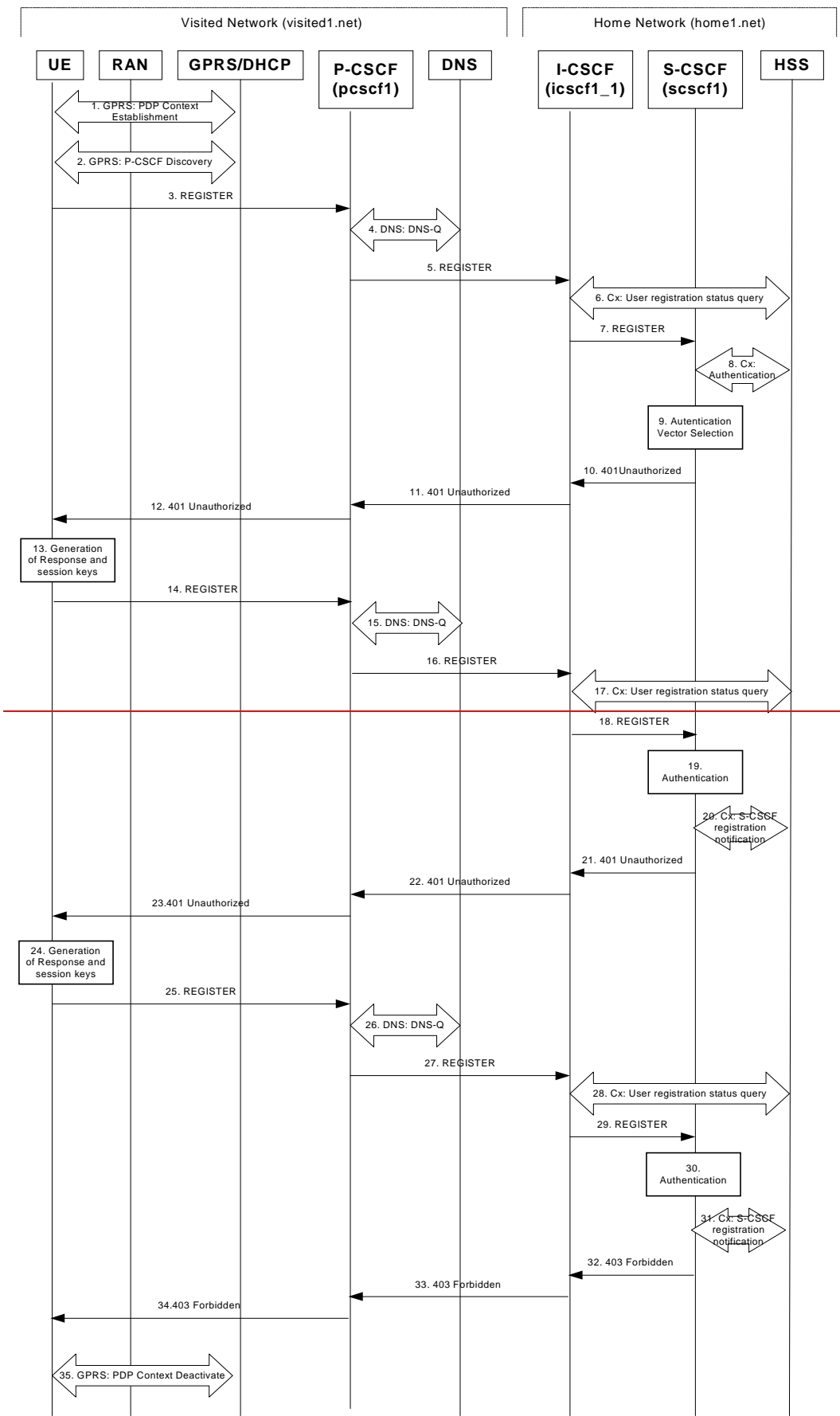
8.9. 403 (Forbidden) response (P-CSCF to UE) - see example in table 6.9.2-89

Table 6.9.2-89: 403 (Forbidden) response (P-CSCF to UE)


```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Warning: 399 homel.net "Roaming not allowed from this network"
From:
To:
Call-ID:
Cseq:
Content-Length:
```

6.9.3 Registration failure – user authentication failure

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



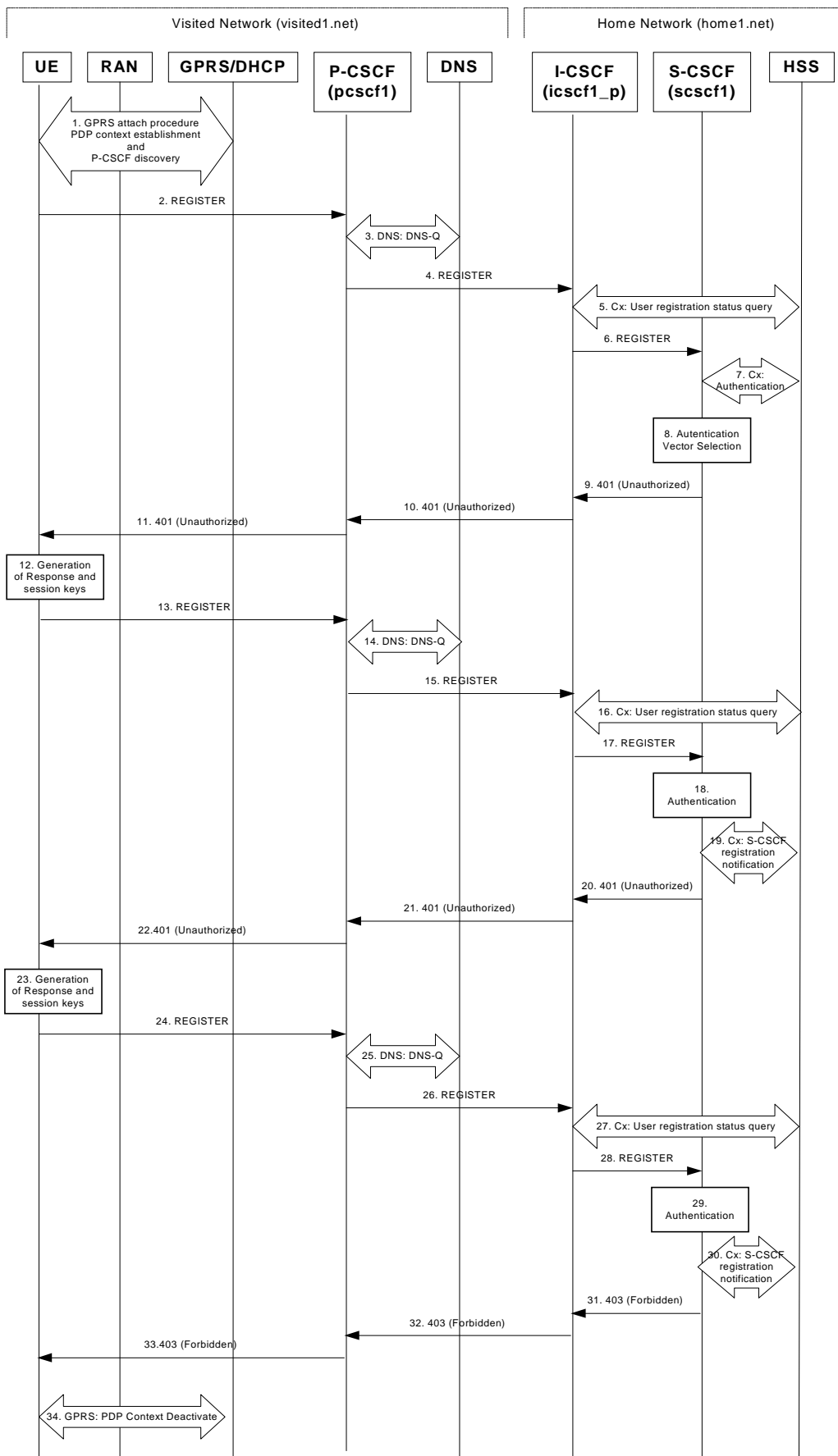


Figure 6.9.3-1: User authentication failure

Steps 1 through 178 are the same as the signalling flow in subclause 6.2.

189. Authentication: User authentication fails

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

At this point the S-CSCF has the option of repeating a number of authentication challenges as given in step 189 through 289. For the purposes of this flow, only one repetition is shown.

1920. Cx. S-CSCF registration notification

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

201. 401 (Unauthorized) response (S-CSCF to I-CSCF) - see example in table 6.9.3-201

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

Table 6.9.3-201: 401 (Unauthorized) response (S-CSCF to I-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID: apb03a0s09dkjdfglkj49111
WWW-Authenticate: Digest realm="registrar.home1.net", nonce=base64(RAND + AUTN + server
    specific data), algorithm=AKAv1-MD5, ik="00112233445566778899aabbccddeeff",
    ck="ffeeddccbbaa11223344556677889900"
CSeq: 2 REGISTER
Content-Length: 0
```

NOTE: The actual nonce value in the WWW-Authenticate header field is encoded in base64, and it may look like: nonce="AY+3fUYo021Qi1Mnv3C6qAzEp4502"

212. 401 (Unauthorized) response(I-CSCF to P-CSCF) - see example in table 6.9.3-212

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

Table 6.9.3-212: 401 (Unauthorized) response (I-CSCF to P-CSCF)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
WWW-Authenticate:
CSeq:
Content-Length:
```

223. 401 (Unauthorized) response (P-CSCF to UE) - see example in table 6.9.3-223

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

Table 6.9.3-223: 401 (Unauthorized) response (P-CSCF to UE)

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
From:
To:
Call-ID:
WWW-Authenticate: Digest realm="registrar.home1.net", nonce=base64(RAND + AUTN + server
                    specific data), algorithm=AKAv1-MD5
Security-Server: ipsec-man; q=0.1; alg=HMAC-SHA1; SPI_P_UDP=87654321; SPI_P_TCP=98765432;
                  Port_P_UDP=7531; Port_P_TCP=8642
CSeq:
Content-Length:
```

WWW-Authenticate: The P-CSCF removes the ik and ck parameters (directives) from the header.

234. Generation of response and session keys at UE

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

245. REGISTER request (UE to P-CSCF) - see example in table 6.9.3-245

Table 6.9.3-245: REGISTER request (UE to P-CSCF)

```
REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49112
Authorization: Digest username="user1_private@home1.net", realm="registrar.home1.net",
                nonce=base64(RAND + AUTN + server specific data), algorithm=AKAv1-MD5,
                uri="sip:registrar.home1.net", response="0alb04c89e54f09ab45e84d30e29f83a"
Security-Verify: ipsec-man; q=0.1; alg=HMAC-SHA1; SPI_P_UDP=87654321; SPI_P_TCP=98765432;
                  Port_P_UDP=7531; Port_P_TCP=8642
CSeq: 3 REGISTER
Expires: 7200
Content-Length: 0
```

Authorization: This carries the response to the authentication challenge received in step 12 along with the private user identity, the realm, the nonce, the URI and the algorithm.

256. DNS: DNS-Q

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

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

Table 6.9.3-256a DNS: DNS Query (P-CSCF to DNS)

```
OPCODE=SQUERY
QNAME=registrar.home1.net, QCLASS=IN, QTYPE=NAPTR
```

The DNS records are retrieved according to RFC 3263 [14].

Table 6.9.3-256b DNS Query Response (DNS to P-CSCF)

```

OPCODE=SQUERY, RESPONSE, AA
QNAME=registrar.home1.net, QCLASS=IN, QTYPE=NAPTR

registrar.home1.net          0 IN NAPTR 50 50 "s" "SIP+D2U" ""
_sip._udp.registrar.home1.net
                             0 IN NAPTR 90 50 "s" "SIP+D2T" "" _sip._tcp.registrar.home1.net
                             0 IN NAPTR 100 50 "s" "SIPS+D2T" ""
_sips._tcp.registrar.home1.net
    
```

Since the UDP is preferred, the P-CSCF finds the I-CSCF by a DNS SRV lookup according to RFC 2782 [4].

Table 6.9.3-256c: DNS: DNS Query (P-CSCF to DNS)

```

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

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

Table 6.9.3-256d: DNS Query Response (DNS to P-CSCF)

```

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

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

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

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

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

267. REGISTER request (P-CSCF to I-CSCF) - see example in table 6.9.3-267

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

Table 6.9.3-267: REGISTER request (P-CSCF to I-CSCF)

```

REGISTER sip:registrar.home1.net SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKdash7
Max-Forwards: 69
Path: <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From:
To:
Contact:
Call-ID:
Authorization: Digest username="user1_private@home1.net", realm="registrar.home1.net",
    nonce=base64(RAND + AUTN + server specific data), algorithm=AKAv1-MD5,
    uri="sip:registrar.home1.net", response="0a1b04c89e54f09ab45e84d30e29f83a",
    integrity-protected="yes"

CSeq:
Expires:
Content-Length:
    
```

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

278. Cx: User registration status query procedure

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

For detailed message flows see 3GPP TS 29.228 [111].

Table 6.9.3-278a provides the parameters in the REGISTER request (flow 5) which need to be sent to HSS.

Table 6.9.3-278a Cx: User registration status query procedure (I-CSCF to HSS)

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

289. REGISTER request (I-CSCF to S-CSCF) - see example in table 6.9.3-289

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

Table 6.9.3-289: REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
[5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

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

2930. Authentication

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

304. Cx: S-CSCF registration notification procedure

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

For detailed message flows see 3GPP TS 29.229.

Table 6.9.3-304 provides the parameters in the REGISTER request (flow 18) which needs to be sent to HSS.

Table 6.9.3-304 Cx: S-CSCF registration notification procedure (S-CSCF to HSS)

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

312. 403 (Forbidden) response (S-CSCF to I-CSCF) - see example in table 6.9.3-312

The S-CSCF sends an 403 (Forbidden) response to the I-CSCF indicating that authentication failed. No security parameters are included in this message response. The S-CSCF will insert a warning header in the response, indicating to the UE the reason of refusing the Registration request. The Warning header will contain the name of the network inserting the warning header (warn-agent = home1.net) and in addition it may contain a warn-text. The warn-code inserted into the Warning header is 399.

Table 6.9.3-312: 403 (Forbidden) response (S-CSCF to I-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Warning: 399 home1.net "Authentication failed"
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>; tag=5ef4
Call-ID: apb03a0s09dkjdfglkj49111
CSeq: 3 REGISTER
Content-Length: 0
```

323. 403 (Forbidden) response (I-CSCF to P-CSCF) - see example in table 6.9.3-323

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

Table 6.9.3-323: 403 (Forbidden) response (I-CSCF to P-CSCF)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Warning: 399 home1.net "Authentication failed"
From:
To:
Call-ID:
CSeq:
Content-Length:
```

334. 403 (Forbidden) response (P-CSCF to UE) - see example in table 6.9.3-33

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

Table 6.9.3-334: 403 (Forbidden) response (P-CSCF to UE)

```
SIP/2.0 403 Forbidden
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Warning: 399 home1.net "Authentication failed"
From:
To:
Call-ID:
CSeq:
Content-Length:
```

345. PDP Context Deactivate

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

16.5 UE subscription for the registration state event package

This section describes the subscription procedure for the registration states event package, whereby the UE requests to be notified by the S-CSCF when the event has occurred. This is done using the information structure as indicated in 3GPP TS 24.229 [16].

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network has network configuration hiding active. For this example the trigger point at the UE for sending out the SUBSCRIBE request is the 200 (OK) response of the user's registration.

Editor's Note: The interaction between the explicit subscription procedure for the Event: ~~registration-state~~[reg](#) event package and the registration procedures needs further consideration. For example: What are the appropriate timer values of Expires header for these procedures considering the signalling is over the radio interface? What is the status of the ongoing explicit subscription procedure (Event: ~~registration-state~~[reg](#) event package) when the registration timer has expired? etc.

Editor's Note: Further clarification with IETF on the setting of Request URI, Remote Party ID and To header has to be done. The values of these headers in the SUBSCRIBE and NOTIFY messages, as well as in their responses, as indicated in sections 16.5, 6.5, 16.6 and 6.6 of 24.228 has to be aligned to the outcome of this clarification.

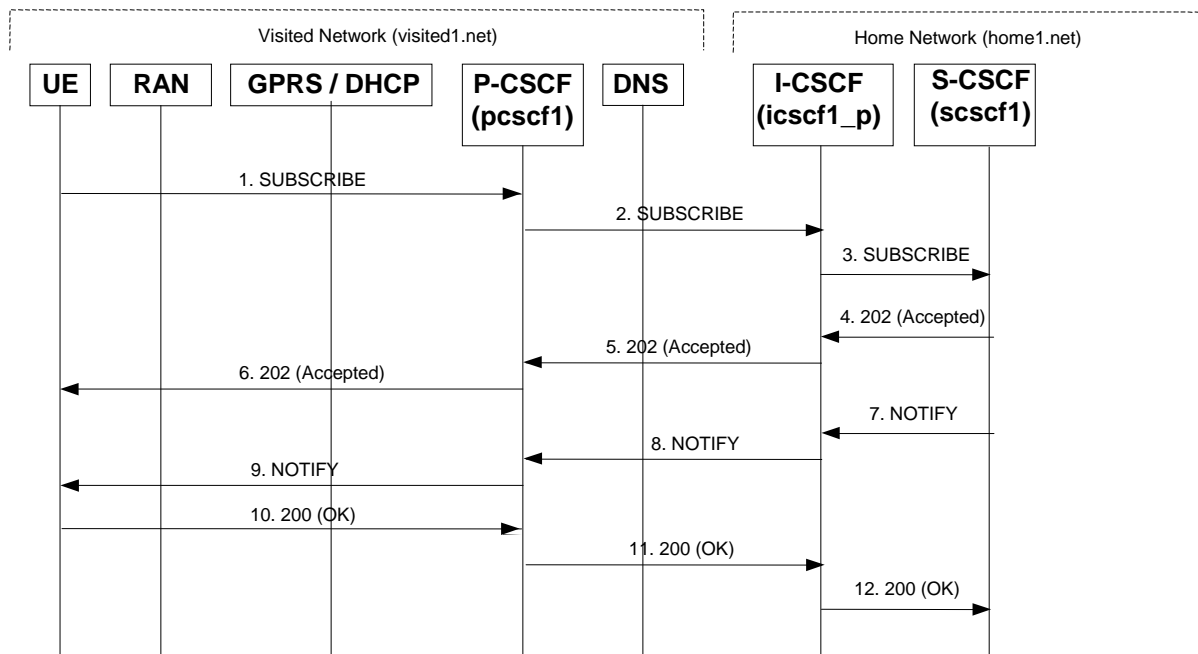
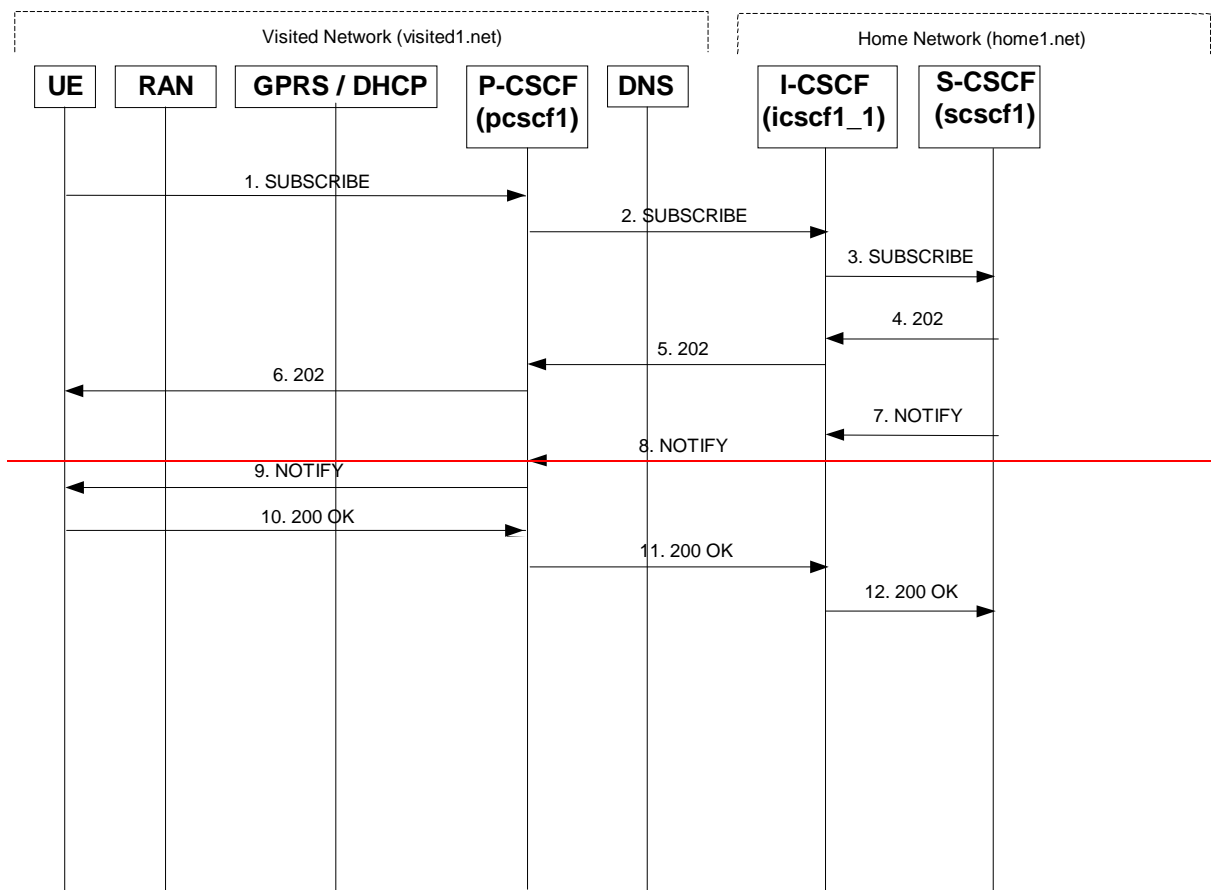


Figure 16.5-1: UE subscription for the registration state event package (with I-CSCF providing configuration independence)

1. SUBSCRIBE request (UE to P-CSCF) – see example in table 16.5-1

The UE generates a SUBSCRIBE request in order to subscribe for the [registration-state](#)_{reg} event package.

The From and To fields both will contain the UE's public address.

Table 16.5-1 SUBSCRIBE request (UE to P-CSCF)

```
SUBSCRIBE sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 70
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy: none
From: <sip:user1_public1@home1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: b89rjhnedlrfjflslj40a222
CSeq: 61 SUBSCRIBE
Event: registration-staterreg
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Content-Length: 0
```

- Request URI:** Public user identity whose events the subscriber subscribes to. In this case the subscribing user and the monitored user are identical.
- From:** This field is populated with logical representation (FQDN) for the entity sending the SUBSCRIBE request.
- Privacy:** the user does not require privacy, therefore the Privacy header is set to the value "none" as specified in draft-ietf-sip-asserted-identity [17] and draft-ietf-sip-privacy-general [13].
- P-Asserted-Identity:** the user provides a hint about the identity to be used for this session.
- Event:** This field is populated with the value '~~registration-stater~~reg' to specify the use of the presence package.
- Accept:** This field is populated with the value 'application/cpim-pidf+xml'.
- To:** Same as the Request-URI.
- Contact:** The contact information of the subscribing user.

Upon receiving the SUBSCRIBE request, the P-CSCF stores the following information about this dialog, for use in possible error recovery actions - see example in table 16.5-1b.

Table 16.5-1b: Storage of information at P-CSCF

```
Request-URI: sip:user1_public1@home1.net
From: sip:user1_public1@home1.net;tag=31415
To: sip:user1_public@home1.net
Call-ID: b89rjhnedlrfjflslj40a222
Cseq(2dest): 61 SUBSCRIBE
Cseq(2orig): none
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
```

2. SUBSCRIBE request (P-CSCF to I-CSCF) – see example in table 16.5-2

P-CSCF looks up the serving network information for the public user identity that was stored during the registration procedure. The SUBSCRIBE request is forwarded to I-CSCF. A Route header is inserted into SUBSCRIBE request. The information for the Route header is taken from the path header as gathered during registration.

Table 16.5-2 SUBSCRIBE request (P-CSCF to I-CSCF)

```

SUBSCRIBE sip:icesf1_p.home1.net;branch=z9hG4bK240f34.1 SIP/2.0
Via: SIP/2.0/UDP pccscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 69
Route: sip:icesf1_p.home1.net;lr, sip:token(sip:scscf1.home1.net;lr)@home1.net;tokenized-
    by=home1.net;token(sescf1.home1.net), sip:user1_public1@home1.net
Record-Route: sip:240f34.1@pccscf1.visited1.net;lr
P-Asserted-Identity: "John Doe" <sip:user1_public1@home1.net>
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
    
```

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

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

3. SUBSCRIBE (I-CSCF to S-CSCF) – see example in table 16.5-3

I-CSCF determines the S-CSCF name in the Route header field to retrieve the routing information. I-CSCF then forwards the SUBSCRIBE request to the S-CSCF.

Table 16.5-3 SUBSCRIBE (I-CSCF to S-CSCF)

```

SUBSCRIBE sip:sescf1.home1.net;branch=z9hG4bK351g45.1 SIP/2.0
Via: SIP/2.0/UDP icesf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pccscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Route: sip:user1_public1@home1.net;lr, sip:scscf1.home1.net;lr
Record-Route: sip:351g45.1@icesf1_p.home1.net;lr, sip:240f34.1@pccscf1.visited1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
    
```

Record-Route: The I-CSCF adds itself to the Record-Route header as it wants to stay on the routing path for network hiding purposes.

Upon receiving the INVITE, the S-CSCF stores the following information about this session, for use in possible error recovery actions - see example in table 16.5-3b.

Table 16.5-3b: Storage of information at S-CSCF

```

Request-URI: sip:sescf1.home1.net;branch=z9hG4bK351g45.1 SIP/2.0
From: sip:user1_public1@home1.net;tag=31415
To: sip:user1_public@home1.net
Call-ID: b89rjhnedlrfjflslj40a222
Cseq(2dest): 61 SUBSCRIBE
Cseq(2orig): none
Route(2orig): sip:icesf1_p.home1.net;lr, sip:pccscf1.home1.visited1.net;lr
Contact(orig): sip:[5555::aaa:bbb:ccc:ddd]
    
```

4. 202 (Accepted) response (S-CSCF to I-CSCF) – see example in table 16.5-4

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

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

Table 16.5-4 202 (Accepted) response (S-CSCF to I-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:332b23.1@scscf1.home1.net,—sip:351g45.1@icscf1_p.home1.net;lr,
    sip:240f34.1@pcscf1.visited1.net;lr
P-Asserted-Identity: "Registrar"—<sip:registrar@scscf1.home1.net>
Privacy: none
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Contact: sip:user1_public1@scscf1.home1.net
Event:
Expires:
Content-Length: 0
```

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

Contact: This is populated with a identifier generated within the S-CSCF that will help it correlate refreshes for the SUBSCRIBE request. It is assumed to be the ~~public id~~ public user identity 'user1_public1' in this case.

5. 202 (Accepted) response (I-CSCF to P-CSCF) – see example in table 16.5-5

The I-CSCF forwards the 202 (Accepted) response to the P-CSCF.

Table 16.5-5 202 (Accepted) response (I-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Record-Route: sip:token(scscf1.home1.net),—sip:351g45.1@icscf1_p.home1.net;lr,
    sip:240f34.1@pcscf1.visited1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Contact: sip:token(user1_public1@sip:scscf1.home1.net)@home1.net;tokenized-by=home1.net
Expires:
Content-Length:
```

6. 202 (Accepted) response (P-CSCF to UE) – see example in table 16.5-6

The P-CSCF sends the 202 (Accepted) response to the UE.

Table 16.5-6 202 (Accepted) response (P-CSCF to UE)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Contact
Expires:
Content-Length:
```

7. NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.5-7

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

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

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

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

Table 16.5-7 NOTIFY request (S-CSCF to I-CSCF)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:iesef1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: sip:icscf1_p.home1.net;lr, sip:240f34.1@pcscf1.visited1.net;lr,
      sip:[5555::aaa:bbb:ccc:ddd]
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID:
CSeq: 42 NOTIFY
Contact: sip:user1_public1@scscf1.home1.net
Expires:
Subscription-State: active;expires=7200
Expires: 7200
Event: registration-statereg
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">

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

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

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

</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in the NOTIFY request that carries the subscriber's registration state is described as indicated in 3GPP TS 24.229 [16].

8. NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.5-8

The I-CSCF translates the S-CSCF address in the Via header and forwards the NOTIFY request to the P-CSCF.

Table 16.5-8 NOTIFY request (I-CSCF to P-CSCF)

```
NOTIFY sip:pcscf1.home1.netsip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenized-by=home1.net
Max-Forwards: 69
Route: sip:pcscf1.visited1.net;lr sip:[5555::aaa:bbb:ccc:ddd]
From:
To:
Call-ID:
Cseq:
Contact: sip:token(user1_public1@sip:scscf1.home1.net)@home1.net;tokenized-by=home1.net
Expires+
Subscription-State:
Expires+
Event:
Content-Type:
Content-Length:
```

9. NOTIFY request (P-CSCF to UE) – see example in table 16.5-9

The P-CSCF sends the NOTIFY request to the user UE.

Table 16.5-9 NOTIFY request (P-CSCF to UE)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 68
From:
To:
Call-ID:
CSeq:
Contact:
Subscription-State:
Expires+
Event:
Content-Type:
Content-Length:
```

10. 200 (OK) response (UE to P-CSCF) – see example in table 16.5-10

UE responds with 200 (OK) response to the NOTIFY request.

Table 16.5-10 200 (OK) response (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

11. 200 (OK) response (P-CSCF to I-CSCF) – see example in table 16.5-11

P-CSCF forwards the 200 (OK) response to the I-CSCF.

Table 16.5-11 200 (OK) response (P-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenisedtokenized-by=home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:
```

12. 200 (OK) response (I-CSCF to S-CSCF) – see example in table 16.5-12

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification is reached to the user.

Table 16.5-12 200 (OK) response (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

16.6 P-CSCF subscription for the registration state event package

This subclause describes the subscription procedure for the registration state event package, whereby the P-CSCF requests to be notified by the S-CSCF when the event has occurred. This is done using the '~~registration-state~~reg' package.

It is assumed that the user has registered prior to initiating subscription of an event. Also, the subscriber is considered to be roaming and the home network has network configuration hiding active. For this example the trigger point at the P-CSCF for sending out the SUBSCRIBE request is the 200 (OK) response of the user's registration.

Editor's Note: The interaction between the explicit subscription procedure for the Event: ~~registration-state~~reg event package and the registration procedures needs further consideration. For example: What are the appropriate timer values of Expires header for these procedures considering the signalling is over the radio interface? What is the status of the ongoing explicit subscription procedure (Event: ~~registration-state~~reg event package) when

the registration timer has expired? etc.

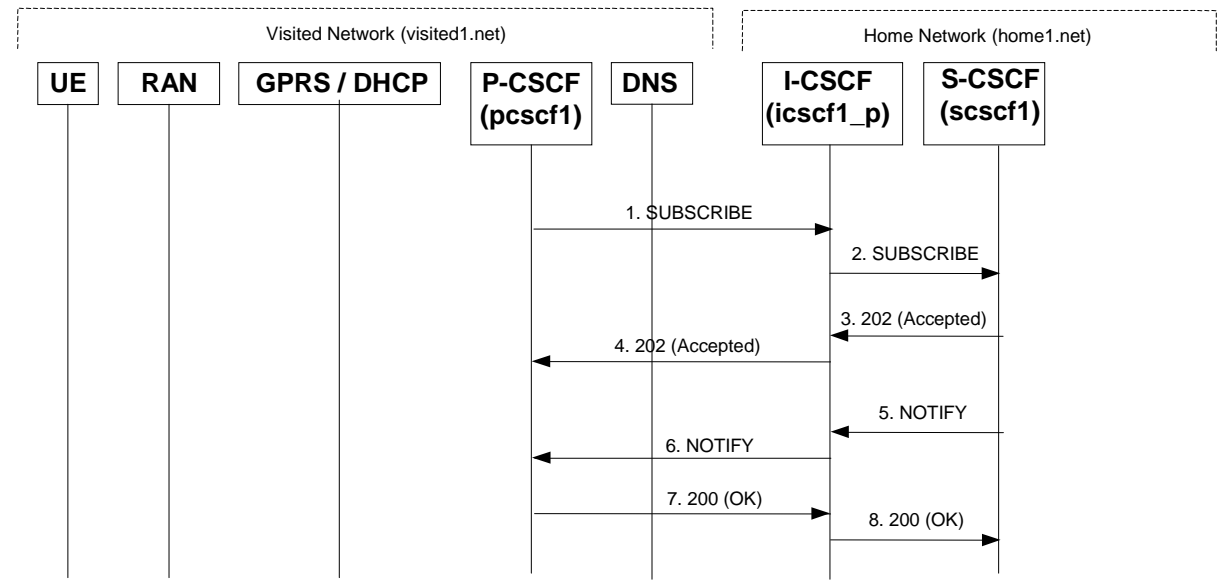
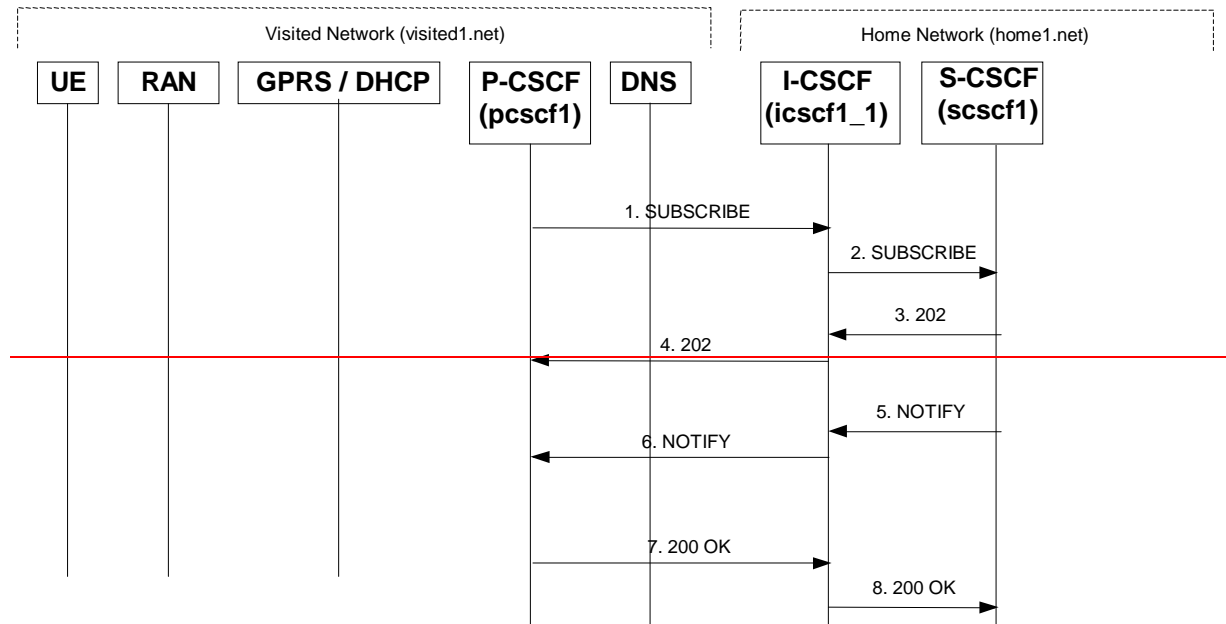


Figure 16.6-1: P-CSCF subscription for the registration state event package (with I-CSCF providing configuration independence)

1. SUBSCRIBE request (P-CSCF to S-CSCF) – see example in table 16.6-1

The P-CSCF generates a SUBSCRIBE request in order to subscribe for the ~~registration-state~~reg event package.

The route is constructed from the monitored user's path header as constructed during registration.

Table 16.6-1 SUBSCRIBE request (P-CSCF to I-CSCF)

```
SUBSCRIBE sip:icscf1_p.home1.net;lr,sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP pcsf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 70
Route: sip:icscf1_p.home1.net;lr, sip:token(sip:scscf1.home1.net;lr)@home1.net;tokenized-
by=home1.net;token(scscf1.home1.net)
P-Asserted-Identity: <sip:pcscf1@visited1.net>sip:pcscf1.visited1.net
Privacy: none
From: <sip:pcscf1.visited1.net>;tag=31415
To: <sip:user1_public1@home1.net>
Call-ID: dre36d2v32gnlgiomm72445223456789@pcscf1.visited1.net
CSeq: 61 SUBSCRIBE
Event: registration-staterreg
Expires: 7200
Accept: application/cpim-pidf+xml
Contact: <sip:user1_public1%40home1.net@pcscf1.visited1.net>
Content-Length: 0
```

Request URI: ~~The next hop on the route to the destination as recorded in the path information for the monitored user during registration.~~ Identifies the resource to subscribe.

Max-Forwards: Set to 70 by the P-CSCF and used to prevent loops.

Route: The token containing a representation of the I-CSCF and S-CSCF allocated to this user, based on the registration information.

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

To: The SIP-URI of the ~~entity which provides information about the monitored user's registration states. In this case this is the address of the registrar of user1_public1~~ resource to which the subscription is sent.

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

Event: This field ~~shall be is~~ set to the value '~~registration-stater~~reg' to specify the use of the ~~registration-stater~~reg package

Accept: This field ~~shall be is~~ set to the value 'application/cpim-pidf+xml'.

2. SUBSCRIBE request (I-CSCF to S-CSCF) – see example in table 16.6-2

I-CSCF determines the S-CSCF name in the Route header field to retrieve the routing information. I-CSCF then forwards the SUBSCRIBE request to S-CSCF.

Table 16.6-2 SUBSCRIBE request (I-CSCF to S-CSCF)

```
SUBSCRIBE sip:scscf1.home1.net;lr,sip:user1_public1@home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 69
Record-Route: sip:351g45-1@icscf1_p.home1.net;lr
P-Asserted-Identity:
Privacy:
From:
To:
Call-ID:
CSeq:
Event:
Expires:
Accept:
Contact:
Content-Length:
```

Record-Route: The I-CSCF adds ~~a route header itself to the Record-Route header~~ as it wants to stay on the routing path for network hiding purposes.

3. 202 (Accepted) response (S-CSCF to I-CSCF) – see example in table 16.6-3

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

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

Table 16.6-3 202 (Accepted) response (S-CSCF to I-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
pcscf1.visited1.net;branch=z9hG4bK240f34.1
Record-Route: sip:332b23.1@scscf1.home1.net, sip:351g45.1@icscf1_p.home1.net;lr,
sip:240f34.1@pcscf1.visited1.net
From:
To: <sip:user1_public1@home1.net>;tag=151170
Call-ID:
CSeq:
Contact: sip:user1_public1@scscf1.home1.net
Event:
Expires:
Content-Length: 0
```

4. 202 (Accepted) response (I-CSCF to P-CSCF) – see example in table 16.6-4

The I-CSCF forwards 202 (Accepted) response to the P-CSCF.

Table 16.6-4 202 (Accepted) response (I-CSCF to P-CSCF)

```
SIP/2.0 202 Accepted
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Record-Route: sip:token(scscf1.home1.net), sip:351g45.1@icscf1_p.home1.net;lr
From:
To:
Call-ID:
CSeq:
Contact: sip:token(user1_public1@sip:scscf1.home1.net)@home1.net;tokenized-by=home1.net
Event:
Expires:
Content-Length:
```

5. NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.6-5

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

The Route header is constructed from the Record-Route header as constructed during subscription.

Table 16.6-5 NOTIFY request (S-CSCF to I-CSCF)

```

NOTIFY sip:user1_public1%40home1.net@pcscf1.visited1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: sip:icscf1_p.home1.net;lr=sip:240f34.1@pcscf1.visited1.net
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@pcscf1.visited1.net>;tag=31415
Call-ID:
CSeq: 42 NOTIFY
Contact: sip:user1_public1@scscf1.home1.net
Expires+
Subscription-State: active;expires=7200
Expires-7200
Event: registration-state-reg
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:">

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

</presence>

```

Request-URI: The contents are the same as the Contact header in the SUBSCRIBE [request](#).

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in the NOTIFY request that carries the subscriber's registration state is described as indicated in 3GPP TS 24.229 [16].

6. NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.6-6

[The](#) I-CSCF translates the S-CSCF address in the Via header and forwards [the](#) NOTIFY [request](#) to [the](#) P-CSCF.

Table 16.6-6 NOTIFY request (I-CSCF to P-CSCF)

```

NOTIFY sip:user1_public1%40home1.net@pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenised@tokenized-by=home1.net
Max-Forwards: 69
From:
To:
Call-ID:
Cseq:
Contact: sip:token(sip:scscf1.home1.net)@home1.net;tokenized-by=home1.net
Subscription-State:
Expires+
Event:
Content-Type:
Content-Length:

```

7. 200 (OK) response (P-CSCF to I-CSCF) – see example in table 16.6-7

P-CSCF forwards the 200 (OK) [response](#) to [the](#) I-CSCF.

Table 16.6-7 200 (OK) response (P-CSCF to I-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenisedtokenized-by=home1.net
From:
To:
Call-ID:
CSeq:
Content-Length: 0

```

8. 200 (OK) response (I-CSCF to S-CSCF) – see example in table 16.6-8

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification is reached to the user.

Table 16.6-8 200 (OK) response (I-CSCF to S-CSCF)

```

SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:

```

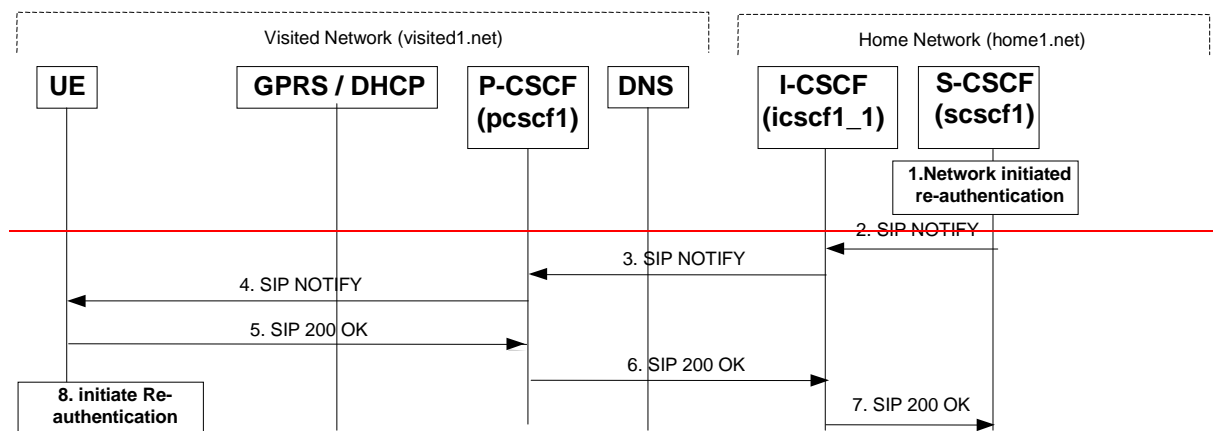
16.7 Notifying of the network initiated deregistration event (not provided)

16.8 Network initiated re-authentication

This subclause describes the notification that occurs when the S-CSCF assigned to that user requests re-authentication in the case where the user's home network provides network configuration hiding.

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

After this procedure the user's UE might automatically initiated re-registration procedures. If the user fails to re-register the public user id for which re-authentication was requested, the public user id entity may be de-registered by S-CSCF.



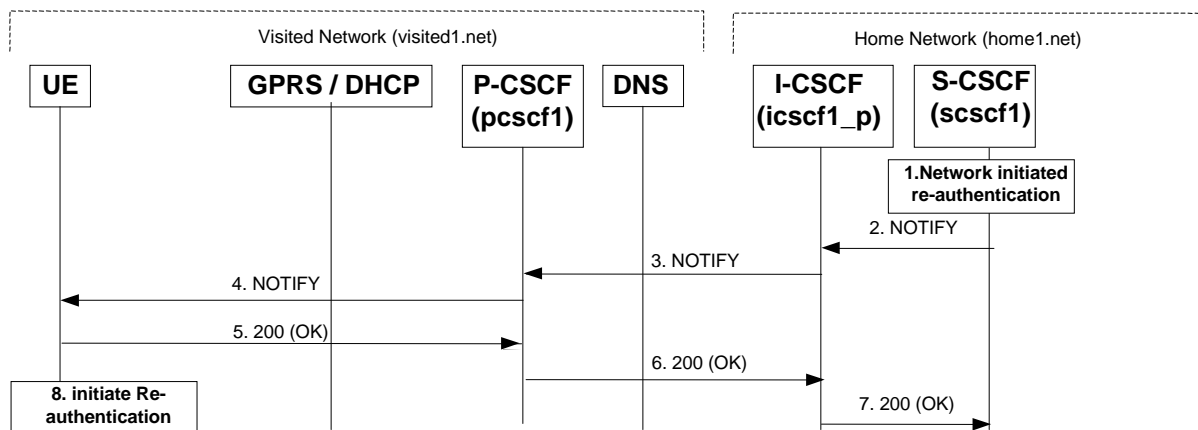


Figure 16.8-1: S-CSCF informs UE that network initiated re-authentication is needed (with I-CSCF providing configuration independence)

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

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

2. SIP NOTIFY request (S-CSCF to I-CSCF) – see example in table 16.8-2

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

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

Table 16.8-2 SIP NOTIFY request (S-CSCF to I-CSCF)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:icscf1_p.home1.net SIP/2.0
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
Max-Forwards: 70
Route: sip:icscf1_p.home1.net;lr, sip:240f34.1@pcscf1.visited1.net;lr,
sip:[5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From: <sip:user1_public1@home1.net>;tag=151170
To: <sip:user1_public1@home1.net>;tag=31415
Call-ID: b89rjhnedlrfjflslj40a222223456789@[5555::aaa:bbb:ccc:ddd]
CSeq: 43 NOTIFY
Subscription-State: active;expires=7200
Expires: 7200
Event: registration-staterereg
Contact: sip:scscf1.home1.net
Content-Type: application/cpim-pidf+xml
Content-Length: (...)

<presence xmlns="urn:ietf:params:xml:ns:cpim-pidf:"
  xmlns:registration="urn:ietf:params:xml:ns:cpim-pidf:registration">
  <tuple name="sip:user1_public1@home1.net">
    <status>
      <basic>open</basic>
      <registration>re-authenticate</registration>
    </status>
  </tuple>
</presence>
```

From: The tag of this field matches that of the To; field in the received 200/202 [response](#) for the SUBSCRIBE [request](#).

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

The message body in the NOTIFY request that carries the subscriber's registration state is described as indicated in 3GPP TS 24.229 [16].

3. SIP NOTIFY request (I-CSCF to P-CSCF) – see example in table 16.8-3

The I-CSCF translates the S-CSCF address in the Via header and forwards [the NOTIFY request](#) to [the P-CSCF](#).

Table 16.8-3 SIP NOTIFY request (I-CSCF to P-CSCF)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd]sip:pcscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP token(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenized-by=home1.net
Max-Forwards: 69
Route: sip:pcscf1.visited1.net;lr sip:[5555::aaa:bbb:ccc:ddd]
Remote-Party-ID:
From:
To:
CALL-ID: Call-ID:
Cseq:
Subscription-State:
Expires:
Event:
Contact: sip:token(sip:scscf1.home1.net)@home1.net;tokenized-by=home1.net
Content-Type:
Content-Length:
```

4. SIP NOTIFY request (P-CSCF to UE) – see example in table 16.8-4

The P-CSCF sends [the NOTIFY request](#) to the [user UE](#).

Table 16.8-4 SIP NOTIFY request (P-CSCF to UE)

```
NOTIFY sip:[5555::aaa:bbb:ccc:ddd] SIP/2.0
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
Max-Forwards: 68
From:
To:
Call-ID:
CSeq:
Subscription-State:
Expires:
Event:
Contact:
Content-Type:
Content-Length:
```

5. SIP 200 (OK) response (UE to P-CSCF) – see example in table 16.8-5

UE responds with [a 200 \(OK\) response to the NOTIFY request](#).

Table 16.8-5 SIP 200 (OK) response (UE to P-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pcscf1.visited1.net;branch=z9hG4bK240f34.1
From:
To:
Call-ID:
CSeq:
Content-Length: 0
```

6. SIP 200 (OK) response (P-CSCF to I-CSCF) – see example in table 16.8-6

P-CSCF forwards the [200 \(OK\) response](#) to [the I-CSCF](#).

Table 16.8-6 SIP 200 (OK) response (P-CSCF to I-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP Ttoken(SIP/2.0/UDP
scscf1.home1.net;branch=z9hG4bK332b23.1)@home1.net;tokenisedtokenized-by=home1.net
From:
To:
Call-ID:
CSeq:
Content-Length:
```

7. SIP 200 (OK) response (I-CSCF to S-CSCF) – see example in table 16.8-7

I-CSCF determines the request and forwards response to S-CSCF. This confirms that notification ~~is~~has reached ~~to~~the ~~user~~UE.

Table 16.8-7 SIP 200 (OK) response (I-CSCF to S-CSCF)

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP scscf1.home1.net;branch=z9hG4bK332b23.1
From:
To:
Call-ID:
CSeq:
Content-Length:
```

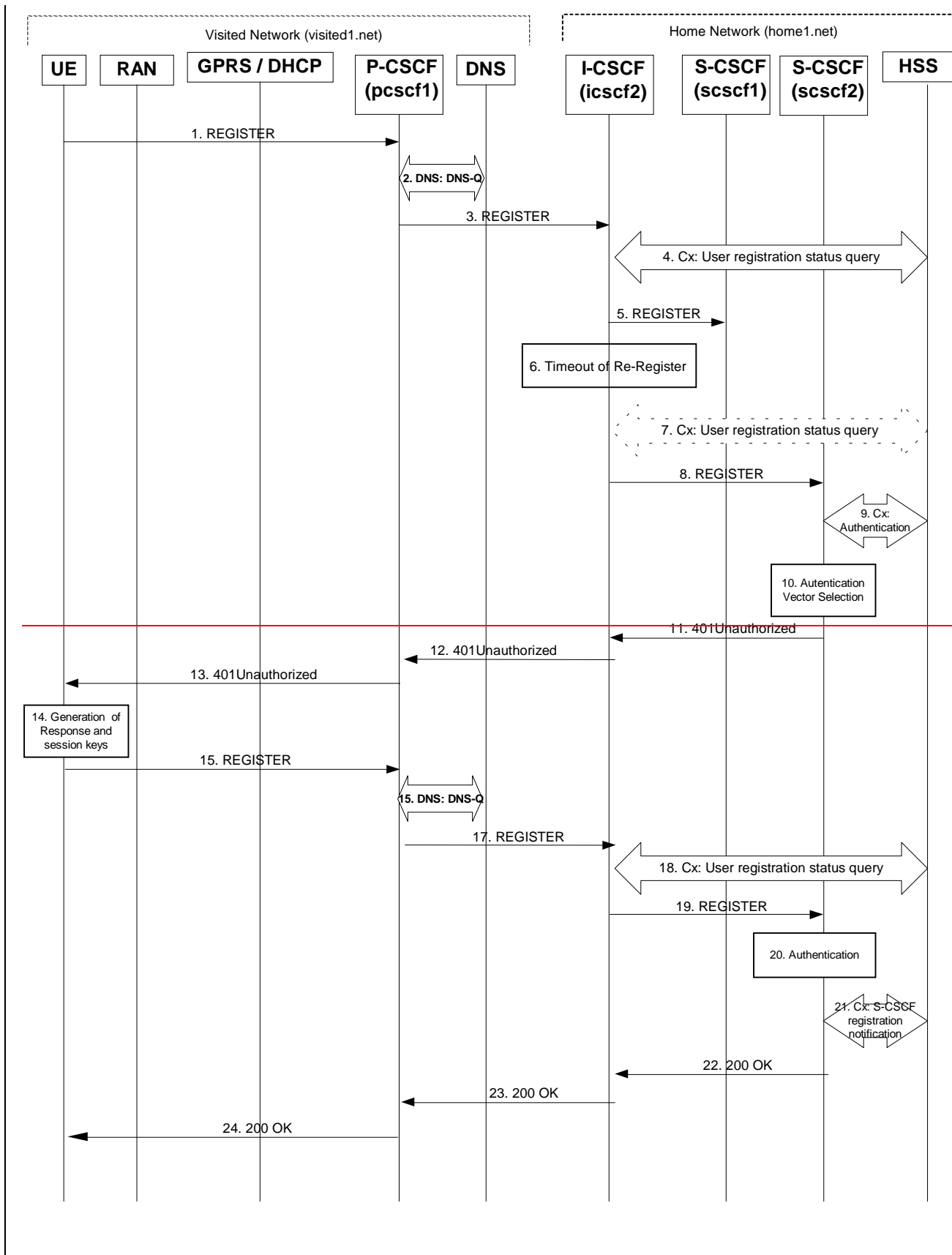
8. Re-authentication (UE)

The UE ~~shall~~now initiates the re-authentication procedures.

16.9 Registration error conditions

16.9.1 Reregistration – failure of reregistration

This signalling flow (see figure 16.9.1-1) is a continuation of the signalling flow in subclause 16.3 after reception of signalling flow 4. This signalling flow shows the recovery after a failure of the S-CSCF that had been assigned to the subscriber in a previous registration.



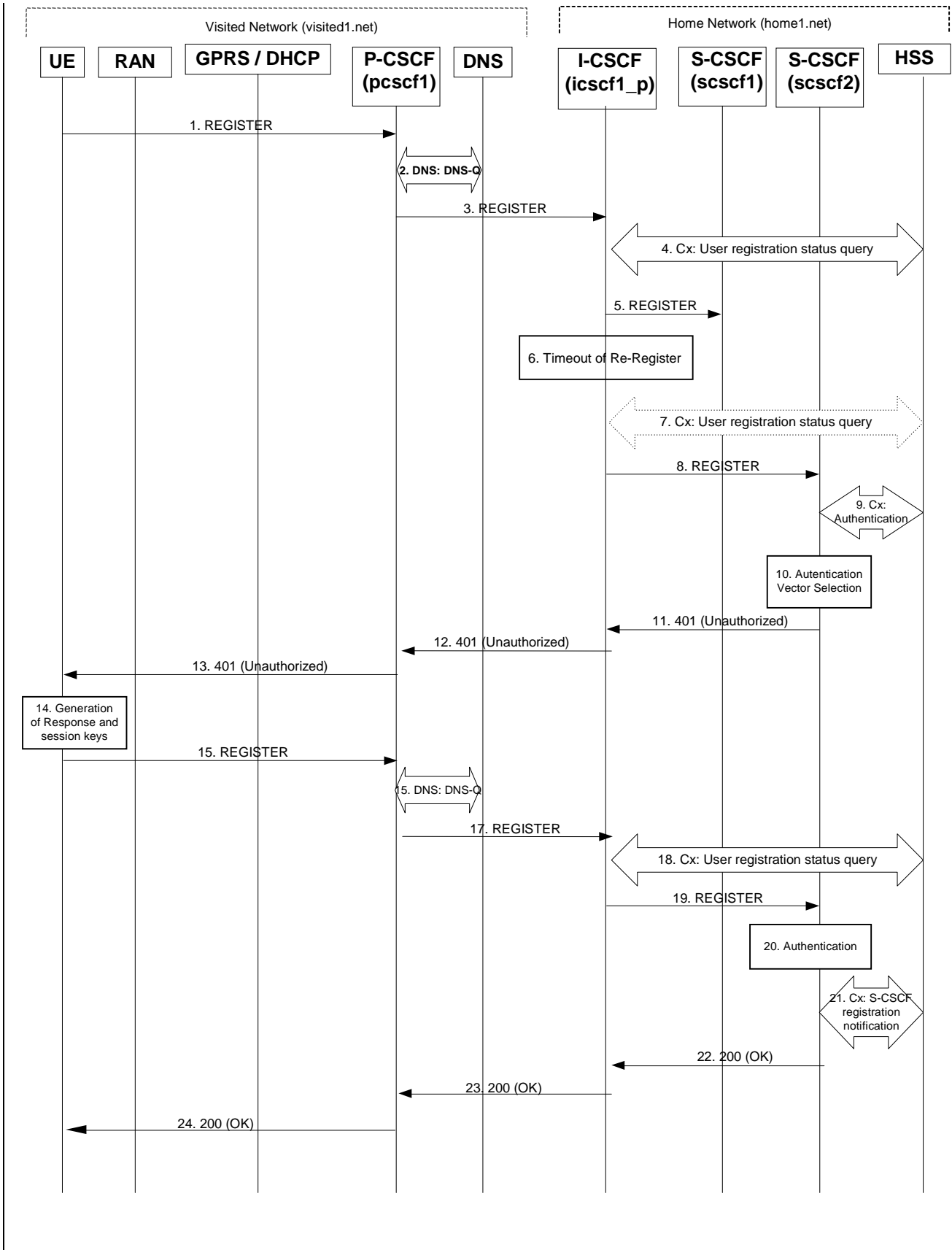


Figure 16.9.1-1: Failure of previous S-CSCF during reregistration

Steps 1 through 4 are the same as the signalling flow in subclause 16.3.

5 REGISTER request (I-CSCF to S-CSCF) – see example in table 16.9.1-5

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

I-CSCF adds a proper I-CSCF name to the Path header.

Table 16.9.1-5 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf1.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Path: <sip:icscf1_p.home1.net>, <sip:pcscf1.visited1.net>
Proxy-require: path
Require: path
Roaming-Info: vnid="Visited Network Number 1"
From: <sip:user1_public1@home1.net>;tag=4fa3
To: <sip:user1_public1@home1.net>
Contact: <sip:[5555::aaa:bbb:ccc:ddd]>
Call-ID: apb03a0s09dkjdfglkj49111
Authorization: Digest username="user1_private@home1.net", realm="registrar.home1.net",
    nonce=base64(RAND + AUTN + server specific data), algorithm=AKAv1-MD5,
    uri="sip:registrar.home1.net", response="0alb04c89e54f09ab45e84d30e29f83a", integrity-
    protected="yes"
CSeq: 10 REGISTER
Expires: 7200
Content-Length: 0
```

6 Timeout of reregister

The I-CSCF times out, waiting for the response from the S-CSCF.

Editor's Note: The value of the timer in this particular instance is FFS. Clearly the value of the timers in the P-CSCF and UE waiting for the response must be considered when choosing this value.

7 Cx: User registration status query (Optional)

The I-CSCF informs the HSS that the S-CSCF for the subscriber is unreachable and requests information related to the required S-CSCF capabilities from the HSS, The HSS sends the capability information required for S-CSCF selection. The I-CSCF uses this information to select a suitable S-CSCF.

This step is optional. Depending on implementation, sufficient information may be available to the I-CSCF from Step 4, to allow the I-CSCF select an alternate S-CSCF. Alternative mechanisms (for example a CSCF management plane) would be used to enable the HSS learn of S-CSCF failure. In addition, the HSS will learn about the assignment of a new S-CSCF in Step 9.

8 REGISTER [request](#) (I-CSCF to S-CSCF) – see example in table 16.9.1-8

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

Table 16.9.1-8 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf2.home1.net SIP/2.0
Via:
Via:
Via:
Max-Forwards: 67
Path:
Path:
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

The next ten steps (9 to18) are the same as in the normal reregistration case (steps 6 to 12 in subclause 16.3).

19. REGISTER request (I-CSCF to S-CSCF) – see example in table 16.9.1-9

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

Table 16.9.1-9 REGISTER request (I-CSCF to S-CSCF)

```
REGISTER sip:scscf2.home1.net SIP/2.0
Via: SIP/2.0/UDP icscf1_p.home1.net;branch=z9hG4bK351g45.1, SIP/2.0/UDP
    pcscf1.visited1.net;branch=z9hG4bK240f34.1, SIP/2.0/UDP
    [5555::aaa:bbb:ccc:ddd];branch=z9hG4bKnashds7
Max-Forwards: 68
Path: <sip:pcscf1.visited1.net>
Proxy-require:
Require:
Roaming-Info:
From:
To:
Contact:
Call-ID:
Authorization:
CSeq:
Expires:
Content-Length:
```

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

The remaining steps (20-25) are the same as in the normal reregistration case (steps 17-22 in subclause 16.3)