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Introduction:

This document contains 1 TS on Rel-5 Work Item "IMS", that have been agreed by TSG CN WG4, and are forwarded to TSG CN Plenary meeting #12 for information.

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3GPP TS 29.228 V1.0.0 (2001-06)

Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Core Network;
IP Multimedia (IM) Subsystem Cx Interface;
Signalling flows and message contents;
(Release 5)**



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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

This 3GPP Technical Specification (TS) specifies the interactions between the HSS (Home Subscriber Server) and the CSCF (Call State Control Functions), referred to as the Cx reference point.

The IP Multimedia (IM) Subsystem stage 2 is specified in 3GPP TS 23.228 [5] and the signaling flows for the IP multimedia call control based on SIP and SDP are specified in 3GPP TS 24.228 [6].

~~Editor's note: Alignment with 24.228 is necessary to avoid duplicate descriptions.~~

This document addresses the Cx reference point related signalling flows ~~from 3GPP TS 23.228 [5]~~.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 41.001: "GSM Release specifications".
- [2] 3GPP TR 21.905: " Vocabulary for 3GPP Specifications ".
- [3] 3GPP TS 23.003: "Numbering, addressing & identification".
- [4] 3GPP TS 23.060: "General Packet Radio Service; Service description; Stage 2".
- [5] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem – Stage 2".

- [6] 3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP".
- [7] 3GPP TS 24.229: "IP multimedia call control protocol based on SIP and SDP".
- [8] 3GPP TS 33.203: "Access security for IP-based services".
- [9] Draft IETF RFC 2543bis "SIP: Session Initiation Protocol". [Before approval this RFC needs to be an approved RFC by IETF](#)
- [10] 3GPP TS 23.002 "Network architecture".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

IP Multimedia session: IP Multimedia session and IP Multimedia call are treated as equivalent in this specification.

3.2 Abbreviations

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

CSCF	Call State Control Function
GPRS	General Packet Radio Service
HPLMN	Home PLMN
HSS	Home Subscriber Server
IE	Information Element
IF	Information Flow
IP	Internet Protocol
I-CSCF	Interrogating CSCF
IM	IP Multimedia
IMS	IP Multimedia Subsystem
MGCF	Media Gateway Control Function
MO	Mobile Originating
MT	Mobile Terminating
NNI	Network Node Interface
PLMN	Public Land Mobile Network
P-CSCF	Proxy CSCF
SIP	Session Initiation Protocol
S-CSCF	Serving CSCF
VPLMN	Visited PLMN

4 Main Concept

This document presents the Cx interface related functional requirements of the communicating entities.

It gives a functional classification of the procedures and describes the procedures and message parameters.

Error handling flows, protocol version identification, etc. procedures are also included.

5 General Architecture

This clause further specifies the architectural assumptions associated with the Cx reference point, building on TS 23.228 [5].

5.1 Functional requirements of network entities

5.1.1 Functional requirements of P-CSCF

There is no requirement for any interaction between the P-CSCF and HSS.

5.1.2 Functional requirements of I-CSCF

The I-CSCF communicates with HSS over the Cx interface.

For functionality of the I-CSCF refer to **Error! Reference source not found.**

5.1.3 Functional requirements of S-CSCF

The S-CSCF communicates with HSS over the Cx interface.

For functionality of the S-CSCF refer to **Error! Reference source not found.**

5.1.4 Functional requirements of HSS

The HSS communicates with I-CSCF and S-CSCF over the Cx interface.

For functionality of the HSS refer to **Error! Reference source not found.**

5.1.5 Functional classification of Cx interface procedures

Operations on the Cx interface ~~can be~~ classified in functional groups:

1. Location management procedures
 - The operations regarding registration and deregistration.
 - Location retrieval operation.
2. Subscriber data handling procedures
 - The download of subscriber information during registration and to support recovery mechanisms.
 - Operations to support the updating of subscriber data and recovery mechanisms.

Editor's note: Recovery mechanisms have not been specified in SA2 yet.

3. Subscriber authentication procedures

Editor's note: There is no approved mechanism for subscriber authentication in SA3 yet.

6 Procedure Descriptions

Editor's note: The mapping of procedures to Diameter commands shall also be described here. These Diameter commands may not necessarily have a 1-to-1 mapping to the Cx messages below.

6.1 Location management procedures

6.1.1 Subscriber registration status query

On receiving a registration request, the I-CSCF shall query the HSS to check the registration status of the user.

The HSS checks if the user has already registered. If the user has not registered yet it shall check according to the user subscription and operator limitations/restrictions whether the user is allowed to register if registering from a visited network.

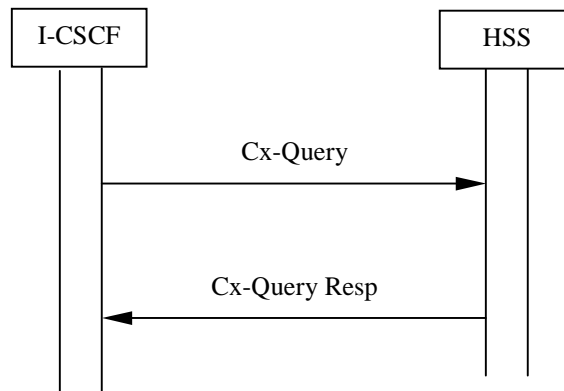


Figure 1: Subscriber registration query

If the user has previously registered the assigned S-CSCF name is included in the response. The response sent to the I-CSCF indicates the result of the registration attempt.

If the user identifier is not known to the HSS, the HSS returns an error indication.

6.1.2 S-CSCF selection assistance

On receiving a registration request, the I-CSCF shall query the HSS for information to be able to assign an appropriate S-CSCF to the user.

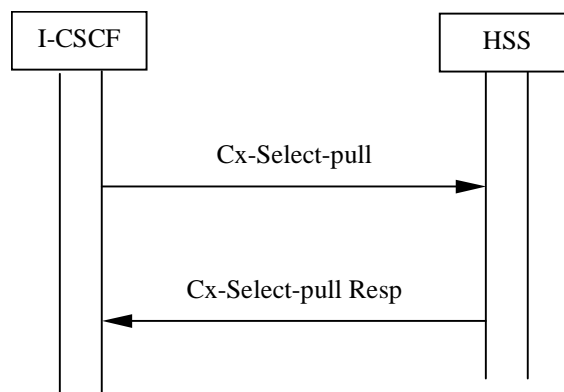


Figure 2: S-CSCF selection assistance query

The response sent to the I-CSCF contains information, which enables the I-CSCF to select an S-CSCF. This information can be operator preference for S-CSCF, required CSCF capability information. The assignment of a S-CSCF for a subscriber is detailed in [5].

6.1.3 S-CSCF registration/deregistration notification

On registering/deregistering a user the S-CSCF shall inform the HSS that the user has been registered/deregistered at this instance. The HSS shall update/clear the assigned S-CSCF to the user in its database according to this information.

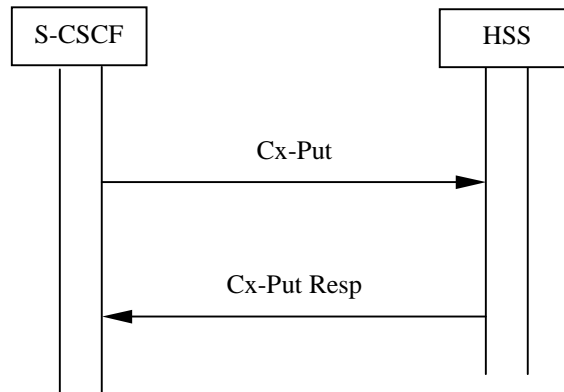


Figure 3: S-CSCF registration/deregistration notification

The response sent to the S-CSCF contains an acknowledgement of the operation.

6.1.4 Network initiated deregistration

In case of network initiated deregistration of the user the HSS shall send a notification to the S-CSCF indicating that the subscriber shall be deregistered. S-CSCF starts deregistration procedure and sends a notification as described in 6.1.3. For details on network initiated deregistration refer to [5].

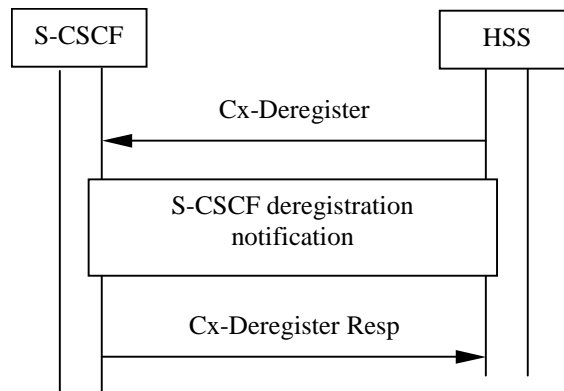


Figure 4: Network initiated deregistration

The response sent to the HSS contains an acknowledgement of the operation.

6.1.5 Subscriber location query

In case of a mobile terminated call the I-CSCF sends a query to the HSS to find out the S-CSCF of the called subscriber.

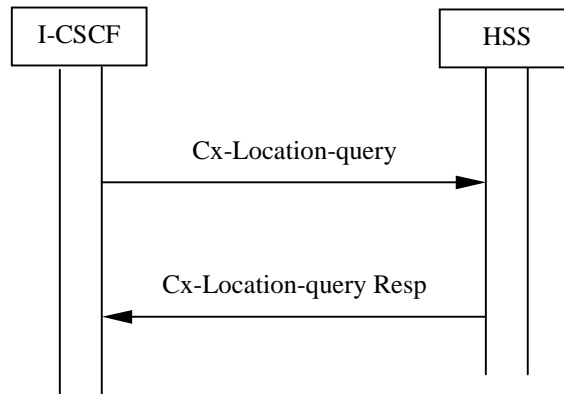


Figure 5: Query of assigned S-CSCF for a subscriber

The response sent to the I-CSCF contains the name of the S-CSCF assigned to the subscriber. For details of call flows refer to [5].

6.2 Subscriber data handling procedures

6.2.1 Subscriber information download

As part of the registration procedure (see [5]) S-CSCF downloads subscriber data and service related information by sending a Cx-Pull message to the HSS.

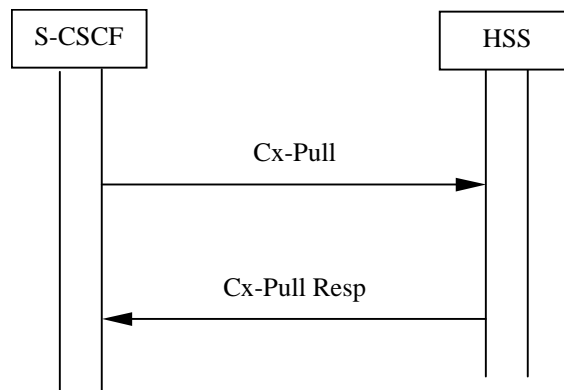


Figure 6: Download of user information

The response sent to the S-CSCF contains the relevant data.

6.2.1 HSS initiated update of user information

Editor's note: the exact procedures shall be defined by SA2.

6.3 Authentication procedures

Editor's note: the exact procedures shall be defined by SA3.

7 Cx Messages Contents

This clause contains the detailed description of the information flows used in the Cx interface.

Each Information Element, IE, is marked as (M) Mandatory, (C) Conditional or (O) Optional. A mandatory information element shall always be present. A conditional information shall be present if certain conditions are fulfilled; if those conditions are not fulfilled it shall be absent. An optional information element may be present or absent, at the discretion of the application at the sending entity.

Editor's note: the message contents are subject to change by SA2. This version of this document reflects the status of 23.228 V2.0.0

7.1 Cx-Query

Table 1 shows the message content for the Cx-Query message sent from I-CSCF to HSS.

Table 1: Cx-Query message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
I-CSCF to HSS	P-CSCF Name		M	This information element indicates the URI of the P-CSCF used by the source network.	8.1	
	Subscriber Identifier		M	This information element indicates the ID of the subscriber whose service is to be registered.	8.2	
	Home Domain Name		M	This information element indicates the Home Domain name.	8.3	
	Visited Network Contact Name		M	This information element indicates the visited network contact name.	8.4	

7.2 Cx-Query Resp

Table 2 shows the message content for the Cx-Query Resp message sent from HSS to I-CSCF.

Table 2: Cx-Query Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to I-CSCF	Registration status		M	This information element indicates the user registration status	8.5	
	S-CSCF Name		C	This information element indicates the assigned S-CSCF name.	8.6	Included in case of the user already registered

7.3 Cx-Select-pull

Table 3 shows the message content for the Cx-Select-pull message sent from I-CSCF to HSS.

Table 3: Cx-Select-pull message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
I-CSCF to HSS	Subscriber Identifier		M	This information element indicates the ID of the subscriber for whom S-CSCF selection will be made.	8.2	

7.4 Cx-Select-pull Resp

Table 4 shows the message content for the Cx-Select-pull Resp message sent from HSS to I-CSCF.

Table 4: Cx-Select-pull Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to I-CSCF	S-CSCF capabilities		M	This information element indicates required capabilities of the S-CSCF to be assigned to the user.	8.7	

7.5 Cx-Put

Table 5 shows the message content for the Cx-Put message sent from ~~S-CSCF to HSS~~ ~~I-CSCF to HSS~~.

Table 5: Cx- Put message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
S-CSCF to HSS	Subscriber Identifier		M	This information element indicates the ID of the subscriber for whom registration will be made.	8.2	
	S-CSCF Name		C	Name of the S-CSCF. Included in case of a registration.	8.6	Included only in case of registration, omitted at deregistration

7.6 Cx-Put Resp

Table 6 shows the message content for the Cx- Put Resp message sent from ~~I-CSCF to HSS~~HSS to S-CSCF.

Table 6: Cx- Put Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to S-CSCF	Registration result		M	This information element indicates the result of registration.	8.8	

7.7 Cx-Deregister

Table 7 shows the message content for the Cx- Deregister message sent from ~~HSS to S-CSCF~~CSCF to HSS.

Table 7: Cx- Deregister message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to S-CSCF	Subscriber Identifier		M	This information element indicates the ID of the subscriber for who de-registration shall be made.	8.2	

7.8 Cx-Deregister Resp

Table 8 shows the message content for the Cx- Deregister Resp message sent from ~~HSS to S-CSCF~~CSCF to HSS.

Table 8: Cx- Deregister Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
S-CSCF to HSS	De-registration result		M	This information element indicates the result of de-registration.	8.8	

7.9 Cx-Location-query

Table 9 shows the message content for the Cx- Location-query message sent from I-CSCF to HSS.

Table 9: Cx- Location-query message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
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I-CSCF to HSS	Subscriber Identifier		M	This information element indicates the ID of the subscriber for whom de-registration shall be made.	8.2	
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7.10 Cx-Location-query Resp

Table 10 shows the message content for the Cx- Location-query Resp message sent from ~~HSS to I-CSCF~~ ~~CSCF to HSS~~.

Table 10: Cx- Location-query Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to I-CSCF	S-CSCF Name		M	This information element indicates the name of the S-CSCF serving the user.	8.6	

7.11 Cx-Pull

Table 11 shows the message content for the Cx- Pull message sent from ~~S-CSCF to HSS~~ ~~CSCF to HSS~~.

Table 11: Cx- Pull message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
S-CSCF to HSS	Subscriber Identifier		M	This information element indicates the user whose profile is to be downloaded.	8.2	

7.12 Cx-Pull Resp

Table 12 shows the message content for the Cx- Pull Resp message sent from ~~HSS to S-CSCF~~ ~~CSCF to HSS~~.

Table 12: Cx- Pull Resp message

Message source & destination	Information element name	Mapping to Diameter AVP	Information element required	Description	Reference	Note
HSS to S-CSCF	Subscriber profile		M	This information element indicates the user whose service is to be registered.	8.9	

8 Information element contents

8.1 P-CSCF Name

This information element contains the SIP Address of P-CSCF.

8.2 Subscriber Identifier

This information element contains the Subscriber Identifier.

8.3 Home Domain Name

This information element indicates the Home Domain name.

8.4 Visited Network Contact Name

This information element indicates the visited network contact name.

8.5 Registration status

This information element contains the registration status for a subscriber: reject (cannot be registered) / allowed / already registered.

8.6 S-CSCF Name

This information element contains the SIP Address of S-CSCF.

8.7 S-CSCF capabilities

This information element contains the S-CSCF capabilities.

8.8 Result

This information element contains result of a registration/deregistration: successful or unsuccessful.

8.9 Subscriber profile

This information element contains the profile of a subscriber.

9 Error handling procedures

Editor's Note: ffs.

10 Protocol version identification

Editor's Note : The set of protocol elements described in this document shall be identified to support IMS in 3GPP release 5 .

11 Operational Aspects

Editor's Note : This clause specifies the lower layer operational requirements such as reliability and security assumptions.

Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
May 2001	CN4 #8	N4-010619			First draft created based on 23.228, N4-010027, N4-010133, N4-010141	0.0.1	0.1.0
June 2001	CN#12	NP-010303			Presented for information at CN#12	0.1.0	1.0.0