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## 7 ***All-IP Core Network Multimedia Domain***

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### **IP Multimedia Subsystem Sh interface; Signaling flows and message contents – Stage 2**

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**All-IP Core Network Multimedia Domain  
IP Multimedia Subsystem Sh interface;  
Signaling flows and message contents – Stage 2**

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9 **Revision History**

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Revision	Changes	Date
0	Initial Publication	December 2003

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1 No text.

## 1 Scope

This document specifies the interactions between the HSS (Home Subscriber Server) and the SIP AS (Application Server) and between the HSS and the OSA SCS (Service Capability Server). This interface is referred to as the Sh reference point.

The IP Multimedia (IM) Core Network Subsystem stage 2 is specified in [1] and the protocol for the IP multimedia call control based on SIP and SDP are specified in [2].

The IP Multimedia (IM) Session Handling with the IP Multimedia (IM) call model is specified in [4].

This document addresses the signalling flows and message contents for the protocol at the Sh interface.

## 2 References

- [1] TIA-873-002: "IP Multimedia (IM) Subsystem – Stage 2".  
3GPP2 X.S0013-002: "IP Multimedia (IM) Subsystem – Stage 2".
- [2] TIA-873-004: "IP Multimedia Call Control Protocol based on SIP and SDP".  
3GPP2 X.S0013-004: "IP Multimedia Call Control Protocol based on SIP and SDP".
- [3] TIA/TSB-151: IP Network Reference Model (NRM) for cdma2000 Spread Spectrum Systems, December 2003.  
3GPP2 S.R0037-0, "3GPP2 All-IP Network Architecture Model Version 2.0, May 14, 2002".
- [4] TIA-873-003: "IP Multimedia (IM) session handling; IM call model".  
3GPP2 X.S0013-003: "IP Multimedia (IM) session handling; IM call model".
- [5] TIA-873-011: "Sh Interface based on Diameter – Protocol details".  
3GPP2 X.S0013-011: "Sh Interface based on Diameter – Protocol details".
- [6] TIA-873-005: "IP Multimedia (IM) Subsystem Cx Interface; Signalling flows and Message Elements".  
3GPP2 X.S0013-005: "IP Multimedia (IM) Subsystem Cx Interface; Signalling flows and Message Elements".
- [7] TIA-873-006: "Cx Interface based on the Diameter protocol ; Protocol details".  
3GPP2 X.S0013-006: "Cx Interface based on the Diameter protocol; Protocol details".
- [8] Internet Engineering Task Force (IETF) RFC 3588, "Diameter Base Protocol", September 2003.
- [9] IETF RFC 3261: "SIP: Session Initiation Protocol".
- [10] IETF RFC 2806: "URLs for Telephone Calls".

## 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.

1 **Transparent data:** Data that is understood syntactically but not semantically by the HSS. It is data that an  
 2 AS may store in the HSS to support its service logic. One example is data that an AS stores in the HSS,  
 3 using it as a repository.

4 **Non-transparent data:** Data that is understood both syntactically and semantically by the HSS.

5 **AS (Application Server):** a term used to denote either of a SIP Application Server or an OSA Service  
 6 Capability Server.

## 7 **3.2 Abbreviations**

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

9	AS	Application Server
10	CSCF	Call Session Control Function
11	HSS	Home Subscriber Server
12	IE	Information Element
13	IP	Internet Protocol
14	IM	IP Multimedia
15	IMS	IP Multimedia Subsystem
16	SIP	Session Initiation Protocol
17	S-CSCF	Serving CSCF

## 18 **4 Main Concept**

19 This document presents the Sh interface related functional requirements of the communicating entities.  
 20 It gives a functional classification of the procedures and describes the procedures and message parameters.  
 21 Error handling flows, protocol version identification, etc. procedures are also included.

## 22 **5 General Architecture**

23 This clause further specifies the architectural assumptions associated with the Sh reference point, building  
 24 on [1] and [4].

### 25 **5.1 Functional requirements of network entities**

#### 26 **5.1.1 Functional Requirements of the Application Server**

27 The Application Server may communicate with the HSS over the Sh interface.  
 28 For functionality of the Application Server refer to [1], [3] and [4].

#### 29 **5.1.2 Functional requirements of HSS**

30 The HSS may communicate with the Application Server over the Sh interface.  
 31 For functionality of the HSS refer to [1], [3] and [4].

### 32 **5.2 Functional classification of Sh interface procedures**

33 Operations on the Sh interface are classified in functional groups:

- 34 1. Data handling procedures
  - 35 - The download of data from the HSS to an AS.
  - 36 - The update of data in the HSS.

- 1 2. Subscription/notification procedures
- 2 - An AS can subscribe to receive notifications from the HSS of changes in data.
- 3 - The HSS can notify an AS of changes in data for which the AS previously had subscribed.

## 4 6 Procedure Descriptions

### 5 6.1 User data handling procedures

#### 6 6.1.1 Data read (Sh-Pull)

7 This procedure is used between an AS the HSS. The procedure is invoked by the AS and is used:

8 To read transparent and/or non-transparent data for a specified user from the HSS. This procedure is  
 9 mapped to the commands User-Data-Request/Answer in the Diameter application specified in [5]. Tables  
 10 6.1.1.1 and 6.1.1.2 detail the involved information elements.

11 This release of the specification does not support location retrieval

12 This release of the specification does not support retrieval of the CS and PS User State data.

13

14

**Table 6.1.1.1: Sh-Pull**

Information element name	Mapping to Diameter AVP	Cat.	Description
User Identity (See 7.1)	User-Identity	M	Identity of the user for whom the data is required.
Requested data (See 7.3)	Data-Reference	M	This information element indicates the reference to the requested information. The set of valid reference values are defined in 7.6.
Requested domain (See 7.2)	Requested-Domain	C	This information element indicates the domains to which the operation is applicable. Check table 7.6.1 to see when it is applicable.
Current Location (See 7.8)	Current-Location	C	This information element indicates whether an active location retrieval has to be initiated or not. It shall be present if Location Information is requested. If this information element takes the value InitiateActiveLocationRetrieval (1) the HSS shall indicate the need to initiate an active location retrieval.
Service Indication (See 7.4)	Service-Indication	C	IE that identifies, together with the User-Identity and Data-Reference, the set of service related transparent data that is being requested..
Application Server Identity (See 7.9)	Origin-Host	M	IE that identifies the AS originator of the request and that is used to check the AS permission list.
Application Server Name (See 7.10)	Server-Name	C	IE that is used, together with the User -Identity and Data-Reference, as key to identify the filter criteria.  This element shall be present when the Data-Reference value is InitialFilterCriteria (13).

15

1

**Table 6.1.1.2: Sh-Pull Resp**

Information element name	Mapping to Diameter AVP	Cat.	Description
Result (See 7.5)	Result-Code / Experimental- Result	M	Result of the request.  Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.  Experimental-Result AVP shall be used for Sh errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.
Data (See 7.6)	User-Data	O	Requested data.

2

### 3 **6.1.1.1 Detailed behaviour**

4 The conditions for the inclusion of Requested-Domain as an additional key to the requested data are  
5 described in table 7.6.1. If repository data is requested, Service-Indication shall be present in the request. If  
6 initial filter criteria are requested, the Server-Name AVP shall contain the SIP URL of the AS that initiates  
7 the request; requests for initial filter criteria are limited to those initial filter criteria which are relevant to  
8 the requesting AS.

9 Upon reception of the Sh-Pull request, the HSS shall, in the following order:

- 10 1. Check that the AS sending the request (identified by the Origin-Host AVP) has Sh-Pull permission  
11 in the AS Permissions List (See 6.2). If not, Experimental-Result-Code shall be set to  
12 DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED in the Sh-Pull Response.
- 13 2. Check that the user for whom data is asked exists in HSS. If not, Experimental-Result-Code shall be  
14 set to DIAMETER\_ERROR\_USER\_UNKNOWN in the Sh-Pull Response.
- 15 3. Check that the requested user data is allowed to be read by the AS.  
16 - If the data referenced in the request is not allowed to be read, Experimental-Result Code shall be  
17 set to DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_READ in the Sh-Pull Response.
- 18 4. Check whether or not the data that is requested to be downloaded by the AS is currently being  
19 updated by another entity. If there is an update of the data in progress, the HSS shall delay the Sh-  
20 Pull-Resp message until the update has been completed and shall include in the Sh-Pull-Resp  
21 message the updated data requested.

22 If there is an error in any of the above steps then the HSS shall stop processing and shall return the error  
23 code specified in the respective step (see [5] and [7] for an explanation of the error codes). Otherwise, the  
24 requested operation shall take place and the HSS shall return the Result-Code AVP set to  
25 DIAMETER\_SUCCESS and the requested data identified by User-Identity and Data-Reference in the Sh-  
26 Pull Response message..

### 27 **6.1.2 Data Update (Sh-Update)**

28 This procedure is used between the AS and the HSS. The procedure is invoked by the AS and is used:

- 29 - To allow the AS to update the transparent (repository) data stored at the HSS for a specified user.

30 This procedure is mapped to the commands Profile-Update-Request/Answer in the Diameter application  
31 specified in [5]. Tables 6.1.2.1 and 6.1.2.2 detail the involved information elements.

32

1

**Table 6.1.2.1: Sh-Update**

Information element name	Mapping to Diameter AVP	Cat.	Description
User Identity (See 7.1)	User-Identity	M	IMS public identity of the user which data is updated.
Data (See 7.6)	User-Data	M	Updated data.
Application Server Identity (See 7.9)	Origin-Host	M	IE that identifies the AS originator of the request and that is used to check the AS permission list.

2

3

**Table 6.1.2.2: Sh-Update Resp**

Information element name	Mapping to Diameter AVP	Cat.	Description
Result (See 7.5)	Result-Code / Experimental-Result	M	Result of the update of data in the HSS.  Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.  Experimental-Result AVP shall be used for Sh errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.

4

**6.1.2.1 Detailed behaviour**

5 Within the Sh-Update Request, the keys to determine the updated data are part of the information element  
6 Data (See 7.6). When data in the repository is updated (i.e. added, modified or removed) Service-Indication  
7 and Sequence-Number are also sent as part of the information element Data.  
8

9 Newly added transparent data shall be associated with a Sequence Number of 0 in the Sh-Update Request.  
10 Sequence Number value 0 is reserved exclusively for indication of newly added transparent data.

11 Modified and removed transparent data shall be associated within the Sh-Update Request with a Sequence  
12 Number of n+1 where n is the original Sequence Number associated with the transparent data before  
13 modification or removal. If n equals 65535, then the next modification or deletion of that transparent data  
14 shall be associated with a Sequence Number of 1.  
15

16 Upon reception of the Sh-Update request, the HSS shall, in the following order:

- 17 1. Check that the AS sending the request (identified by the Origin-Host AVP) has Sh-Update permission  
18 in the AS Permissions List (See 6.2). If the AS does not have Sh-Update permission, Experimental-  
19 Result-Code shall be set to DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED in the Sh-Update  
20 Response.
- 21 2. Check that the user for whom data is asked to be updated exists in the HSS. If not, Experimental-  
22 Result-Code shall be set to DIAMETER\_ERROR\_USER\_UNKNOWN in the Sh-Update Response.
- 23 3. Check that the user data that is requested to be updated by the AS, is allowed to be updated. If the data  
24 is not allowed to be updated, Experimental-Result Code shall be set to  
25 DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_MODIFIED in the Sh-Update Response.
- 26 4. Check whether or not the data that is requested to be updated by the AS, as identified by the Service-  
27 Indication, is currently being updated by another entity. If there is an update of the data in progress,  
28 Experimental-Result Code shall be set to DIAMETER\_PRIOR\_UPDATE\_IN\_PROGRESS in the Sh-  
29 Update Response.

- 1 5. Check whether or not there is any repository data stored at the HSS already for the specified Service-  
2 Indication and the associated user.
- 3 - If repository data identified by the Service-Indication is stored at the HSS for the specified user,  
4 check the following premises:
- 5 1. Sequence\_Number\_in\_Sh\_Update is not equal to 0
- 6 2. (Sequence\_Number\_in\_Sh\_Update - 1) is equal to (Sequence\_Number\_In\_HSS modulo  
7 65535)
- 8 - If either of the above premises is false then Experimental-Result-Code shall be set to  
9 DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC in the Sh-Update Response.
- 10 - If both of the above premises are true, then check whether or not Service Data is received within  
11 the Sh-Update Req.
- 12 - If Service Data is included in the Sh-Update Req, check whether or not the size of the data is  
13 greater than that which the HSS is prepared to accept.
- 14 - If there is more data than the HSS is prepared to accept then Experimental-Result-Code  
15 shall be set to DIAMETER\_ERROR\_TOO\_MUCH\_DATA and the new data shall be  
16 discarded.
- 17 - If the HSS is prepared to accept the data, then the repository data stored at the HSS shall  
18 be updated with the repository data sent in the Sh-Update Req and the Sequence Number  
19 associated with that repository data shall be updated with that sent in the Sh-Update Req.  
20 This triggers the sending of Sh-Notif messages to any other ASs that are subscribed to  
21 Notifications for updates to the service data for that user (see 6.1.4).
- 22 - If Service Data is not received, the data stored in the repository at the HSS shall be removed,  
23 and as a consequence the Service Indication and the Sequence Number associated with the  
24 removed data shall also be removed. This triggers the sending of Sh-Notif messages to any  
25 other ASs that are subscribed to Notifications for updates to the service data for that user (see  
26 6.1.4). After sending Sh-Notif messages, the subscriptions to Notifications for the removed  
27 Repository Data shall be deleted.
- 28 - If repository data identified by the Service-Indication is not stored for the user i.e. the Sh-Update Req  
29 intends to create a new repository data, check whether or not the Sequence Number in the Sh-Update  
30 Req is 0.
- 31 - If the sequence number is not set to 0, Experimental-Result Code shall be set to  
32 DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC
- 33 - If the sequence number is set to 0 check whether Service Data is included within the Sh-Update  
34 Req.
- 35 - If Service Data is not included in the Sh-Update Req, then Experimental-Result-Code  
36 shall be set to DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED and the operation  
37 shall be ignored by the HSS.
- 38 - If Service Data is included in the Sh-Update Req, check whether or not the size of the  
39 data is greater than that which the HSS is prepared to accept. If there is more data than the  
40 HSS is prepared to accept then Experimental-Result-Code shall be set to  
41 DIAMETER\_ERROR\_TOO\_MUCH\_DATA and the new data shall be discarded.
- 42 - If the HSS is prepared to accept the data included in the Sh-Update Req, then the data  
43 shall be stored within the data repository in the HSS.

1 If there is an error in any of the above steps then the HSS shall stop processing and shall return the error  
 2 code specified in the respective step (see [5] and [7] for an explanation of the error codes). Otherwise, the  
 3 requested operation shall take place and the HSS shall return the Result-Code AVP set to  
 4 DIAMETER\_SUCCESS.

5 NOTE: When an AS receives DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC  
 6 the AS may attempt to resolve the inconsistency between the version of the repository data  
 7 that it holds and that stored at the HSS. It may execute a Sh-Pull to retrieve the current  
 8 version of the data from the HSS or it may wait to receive a subsequent Sh-Notif message  
 9 from the HSS for the affected repository data.

10

### 11 6.1.3 Subscription to notifications (Sh-Subs-Notif)

12 This procedure is used between an AS and the HSS of changes in data. . The procedure is invoked by the  
 13 AS and is used:

14 - To subscribe to Notifications for when particular transparent and/or non-transparent data for a  
 15 specified user is updated, from the HSS

16 This procedure is mapped to the commands Subscribe-Notifications-Request/Answer in the Diameter  
 17 application specified in [5]. Tables 6.1.3.1 and 6.1.3.2 detail the information elements involved.

18

19

**Table 6.1.3.1: Sh-Subs-Notif**

Information element name	Mapping to Diameter AVP	Cat.	Description
User Identity (See 7.1)	User-Identity	M	IMS public identity of the user for whom notifications of data changes are requested.
Requested data (See 7.3)	Data-Reference	M	This information element includes the reference to the data on which notifications of change are required (valid reference values are defined in 7.6).
Subscription request type (See 7.7)	Subs-Req-Type	M	This information element indicates the action requested on subscription to notifications.
Service Indication (See 7.4)	Service-Indication	O	IE that identifies, together with the User-Identity and Data-Reference, the set of service related transparent data for which notifications of changes are requested..
Application Server Identity (See 7.9)	Origin-Host	M	IE that identifies the AS originator of the request and that is used to check the AS permission list.
Application Server Name(See 7.10)	Server-Name	C	IE that is used, together with the User-Identity and Data-Reference, as key to identify the filter criteria.  This element shall be present when the Data-Reference value is InitialFilterCriteria (13).

20

1

**Table 6.1.3.2: Sh-Subs-Notif Resp**

Information element name	Mapping to Diameter AVP	Cat.	Description
Data request result (See 7.5)	Result-Code / Experimental-Result	M	Result of the request.  Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.  Experimental-Result AVP shall be used for Sh errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.

2

**3 6.1.3.1 Detailed behaviour**

4 The HSS shall take note of the subscription request on the data identified by User-Identity and Data-  
5 Reference. If notifications on changes of repository data are requested, Service-Indication shall be present  
6 in the request. If notifications on changes of filter criteria are requested, the Server-Name AVP shall be  
7 used as key to the filter criteria. The Server-Name AVP shall contain the SIP URL of the AS sending the  
8 request.

9 Upon reception of the Sh-Subs-Notif request, the HSS shall, in the following order (if there is an error in  
10 any of the following steps the HSS shall stop processing and return the corresponding error code, see [5]  
11 and [7]):

- 12 1. Check that the user for whom notifications are asked exists in HSS. If not, Experimental-Result  
13 Code shall be set to DIAMETER\_ERROR\_USER\_UNKNOWN in the Sh-Subs-Notif Response.
- 14 2. Check that the AS sending the request (identified by the Origin-Host AVP) has Sh-Subs-Notif  
15 permission in the AS Permissions List (See 6.2). If the AS does not have Sh-Subs-Notif permission,  
16 Experimental-Result Code shall be set to DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED  
17 in the Sh-Subs-Notif Response.
- 18 3. Check that Notifications are allowed for the requested user (see table 7.6). If the Notifications of  
19 changes in the data referenced in the request are not allowed, Experimental-Result Code shall be set  
20 to DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_NOTIFIED in the Sh-Subs-Notif  
21 Response.

**22 6.1.4 Notifications (Sh-Notif)**

23 This procedure is used between the HSS and the AS. The procedure is invoked by the HSS and is used:

- 24 - To inform the AS of changes in transparent and/or non-transparent data to which the AS has  
25 previously subscribed to receive Notifications for, using Sh-Subs-Notif (see 6.1.3).

26 This procedure is mapped to the commands Push-Notification-Request/Answer in the Diameter application  
27 specified in [5]. Tables 6.1.4.1 and 6.1.4.2 detail the involved information elements.

28

1

**Table 6.1.4.1: Sh-Notif**

Information element name	Mapping to Diameter AVP	Cat.	Description
User Identity (See 7.1)	User-Identity	M	IMS public identity of the user which data has changed.
Data (See 7.6)	User-Data	M	Changed data.

2

3

**Table 6.1.4.2: Sh-Notif Resp**

Information element name	Mapping to Diameter AVP	Cat.	Description
Data request result (See 7.5)	Result-Code / Experimental-Result	M	Result of the request.  Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.  Experimental-Result AVP shall be used for Sh errors. This is a grouped AVP which contains the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP.

4

**6.1.4.1 Detailed behaviour**

5 The keys to the updated data are part of the information element User-Data (See Annex C). When data  
6 repository is updated Service-Indication is also part of the information element User-Data.  
7

**6.2 AS permissions list**

8 The HSS shall maintain a list of AS permissions (the 'AS Permissions List'). AS permissions are identified  
9 by AS identity and Data Reference (See Table 7.6.1). The possible permissions are Sh-Pull, Sh-Update, Sh-  
10 Subs-Notif or any combination of these permissions. The permissions apply to all users served by the HSS,  
11 they are not user specific. When an AS requests Sh-Pull, Sh-Update or Sh-Subs-Notif the HSS shall check  
12 permissions and return an error result if the AS does not have the required permission.  
13

**7 Information element contents****7.1 User Identity**

14 This information element contains a user public identity (either SIP-URL, TEL-URL or MDN).  
15

**7.2 Requested Domain**

16 This information element details the access domains for which certain data (e.g. user state, location  
17 information) are requested. See [5] for the list of possible values.  
18  
19

**7.3 Requested Data**

20 Reference to the data that an AS is requesting from the HSS. Reference to the data which an AS wants to  
21 be notified of, when changed. Reference to data for which subscription to notification of change is rejected.  
22 See chapter 7.6.  
23

## 1 **7.4 Service Indication**

2 Identifier of one set of service related transparent data, which is stored in an HSS in an operator network. It  
3 shall be unique within an operator network. Per user and value of Service Indication the HSS may allocate  
4 memory space to implement a data repository to store transparent data.

## 5 **7.5 Result**

6 This information element contains the result code of the operation. See [5] for the list of possible values.

## 7 **7.6 Data**

8 This information element contains an XML document conformant to the XML schema defined in Annex D.

9 Annex C specifies the UML logical model of the data downloaded via the Sh interface.

10 Table 7.6.1 defines the reference values, access key and recommended access rights for the data accessible  
11 via the Sh interface. It is a matter of operator policy to further restrict the access rights defined in table  
12 7.6.1.

13 **Table 7.6.1: Data accessible via Sh interface**

<b>Data Ref.</b>	<b>XML tag</b>	<b>Defined in</b>	<b>Access key</b>	<b>May be included in the operations:</b>
0	RepositoryData	7.6.1	User-Identity + Data-Reference + Service-Indication	Sh-Pull, Sh-Update, Sh-Subs-Notif
10	PublicIdentifiers	7.6.2	User-Identity + Data-Reference	Sh-Pull
11	IMSUserState	7.6.3		Sh-Pull, Sh-Subs-Notif
12	S-CSCFName	7.6.4		Sh-Pull, Sh-Subs-Notif
13	InitialFilterCriteria	7.6.5	User-Identity + Data-Reference + Serve-Name	Sh-Pull, Sh-Subs-Notif
14	LocationInformation	7.6.6	User-Identity + Data-Reference + Requested Domain	Sh-Pull
15	User State	7.6.7		
16	Charging information	7.6.8		Sh-Pull

14

### 15 **7.6.1 Repository Data**

16 This information element contains transparent data. A data repository may be shared by more than one AS  
17 implementing the same service.

### 18 **7.6.2 PublicIdentifiers**

19 This information element contains the list of public identities of the user.

### 20 **7.6.3 IMSUser State**

21 This information element contains the IMS USER State of the public identifier referenced. Its possible  
22 values are: REGISTERED, NOT\_REGISTERED, AUTHENTICATION\_PENDING and  
23 REGISTERED\_UNREG\_SERVICES.

1 **7.6.4 S-CSCF Name**

2 This information element contains the name of the S-CSCF where a multimedia public identity is  
3 registered.

4 **7.6.5 Initial Filter Criteria**

5 This information element contains the triggering information for a service.  
6 For a more detailed description, refer to [4] and [6].

7 **7.6.6 void**

8

9 **7.6.6.1 void**

10

11 **7.6.6.2 void**

12

13 **7.6.7 Void**

14 **7.6.8 Charging information**

15 This information element contains the addresses of the charging functions (primary event charging function  
16 name, secondary event charging function name, primary charging collection function name, secondary  
17 charging collection function name). When a clash occurs between the charging function address(es)  
18 received over the ISC interface and those received over the Sh interface, the address(es) received over the  
19 ISC interface should take precedence.

20 NOTE: The use of the Sh interface to retrieve charging function addresses is not intended as a  
21 general-purpose alternative to receiving charging function addresses from the ISC interfaces.  
22 Rather, it is meant to address a special case where the AS needs to interact with the charging  
23 system before initiating a request to a user when the AS has not received the third party  
24 REGISTER for that user.

25

26 **7.7 Subscription request type**

27 This information element indicates the action requested for subscription to notifications. See [5] for the list  
28 of valid values.

29 **7.8 Current Location**

30 This information element indicates whether an active location retrieval has to be initiated or not when an  
31 AS requested location information. See [5] for the list of possible values.

32 **7.9 Application Server Identity**

33 This information element contains the identity of the Application Server. It is used for the AS permission  
34 check (see 6.2).

1 **7.10 Application Server Name**

2 This information element indicates application server's SIP URI. See [7] for the detailed definition of the  
3 AVP.

4

5 **8 Protocol version identification**

6 See [5].

7 **9 Operational Aspects**

8 See [5].

9

## Annex A (normative): Mapping of Sh operations and terminology to Diameter

### A.1 Introduction

This appendix gives mappings from Sh to Diameter protocol elements. Diameter protocol elements are defined in [5].

### A.2 Sh message to Diameter command mapping

The following table defines the mapping between stage 2 operations and Diameter commands:

**Table A.2.1: Sh message to Diameter command mapping**

Sh message	Source	Destination	Command-Name	Abbreviation
Sh-Pull	AS	HSS	User-Data-Request	UDR
Sh-Pull Resp	HSS	AS	User-Data-Answer	UDA
Sh-Update	AS	HSS	Profile-Update-Request	PUR
Sh-Update Resp	HSS	AS	Profile-Update-Answer	PUA
Sh-Subs-Notif	AS	HSS	Subscribe-Notifications-Request	SNR
Sh-Subs-Notif Resp	HSS	AS	Subscribe-Notifications-Answer	SNA
Sh-Notif	HSS	AS	Push-Notification-Request	PNR
Sh-Notif Resp	AS	HSS	Push-Notification-Answer	PNA

### A.3 Sh message parameters to Diameter AVP mapping

The following table gives an overview about the mapping:

**Table A.3.1: Sh message parameters to Diameter AVP mapping**

Sh parameter	AVP Name
User identity	User-Identity
Requested data, Unauthorized data	Data-Reference
Service Indication	Service-Indication
Result, Data Request Result, Data Update Result	Result-Code / Experimental-Result
Requested Data, Updated data, Changed data	User-Data
Subscription request type	Subs-Req-Type
Unauthorized data	Data-Reference
Requested Domain	Requested-Domain
Current Location	Current-Location
Application Server Identity	Server-Name

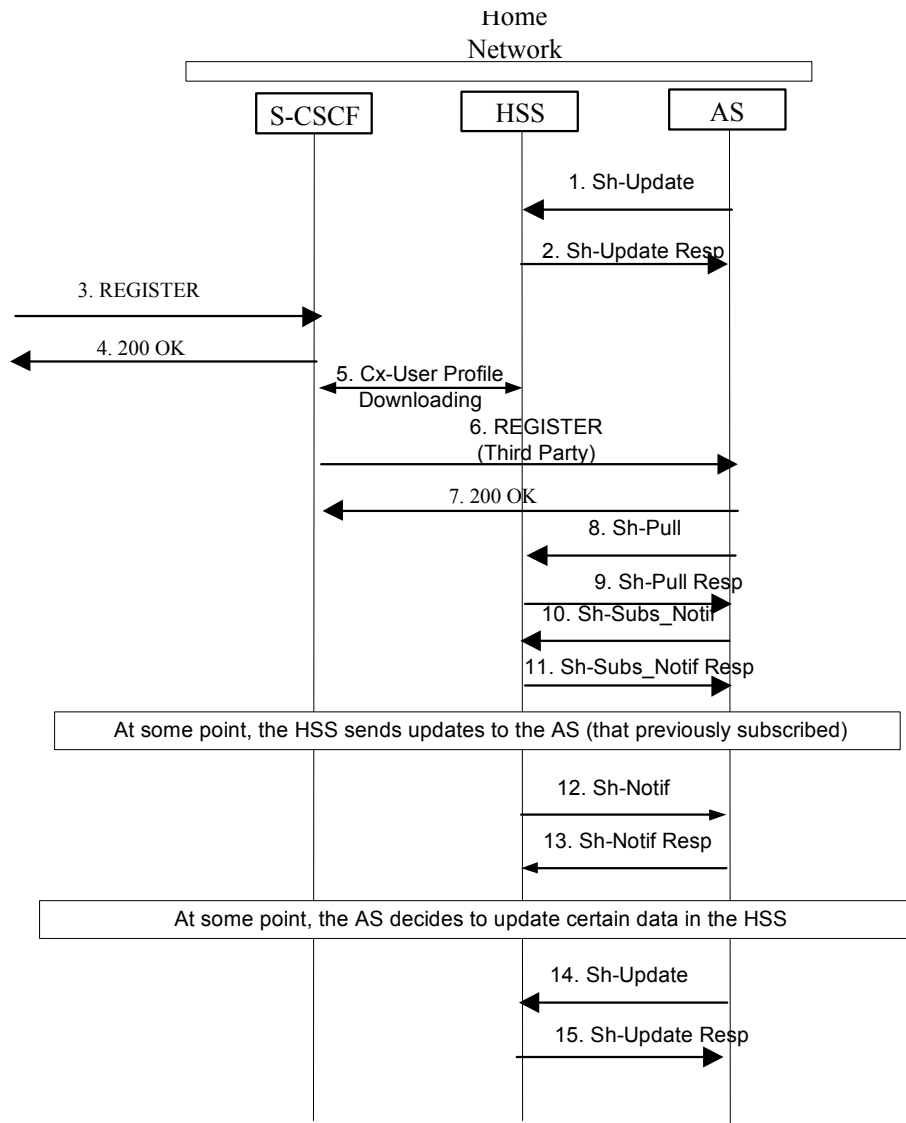
1 **Annex B (informative): Message flow**

2 **B.1 Message flows**

3 The following message flows give examples regarding which Diameter messages shall be sent in scenarios  
 4 described in [4].

5

6 **B.1.1 Data Update, Registration, Notification Subscription.**



7

8 **Figure B.1.1: Data Update, Registration, Notification Subscription**

- 1 1. A user subscribes to a new service. The operator provisions the service in an AS. The AS stores  
2 some service data for a user in the HSS, Sh-Update (user identity, updated data) e.g. repository  
3 data.
- 4 2. HSS confirms the data is updated
- 5 3. Some time later, user registers with the network
- 6 4. 200 OK
- 7 5. S-CSCF downloads the data from the HSS. Filter criteria specify that the AS wants to be notified  
8 that the end user is registered.
- 9 6. S-CSCF sends third party registration message to the application server to notify that user is  
10 registered.
- 11 7. 200 OK
- 12 8. The AS downloads data needed for providing service from HSS, by means of Sh-Pull (user  
13 identity, requested data, and service information).
- 14 9. HSS sends data to AS
- 15 10. The AS subscribes to notifications from the HSS of changes in data, by means of Sh-Subs-Notif  
16 (user identity, requested data, and/or service information).
- 17 11. The HSS confirms the subscription request.
- 18 12. At some moment, user data is updated in the HSS. As the AS subscribed to notifications (step 10),  
19 the HSS sends to the AS the requested updates, by means of Sh-Notif (user identity, updated data).
- 20 13. The AS acknowledges the notification.
- 21 14. At some moment, the AS decides to update user's service data e.g. repository data in the HSS, by  
22 means of Sh-Update (user identity, updated data).
- 23 15. The HSS confirms the service data is updated.
- 24

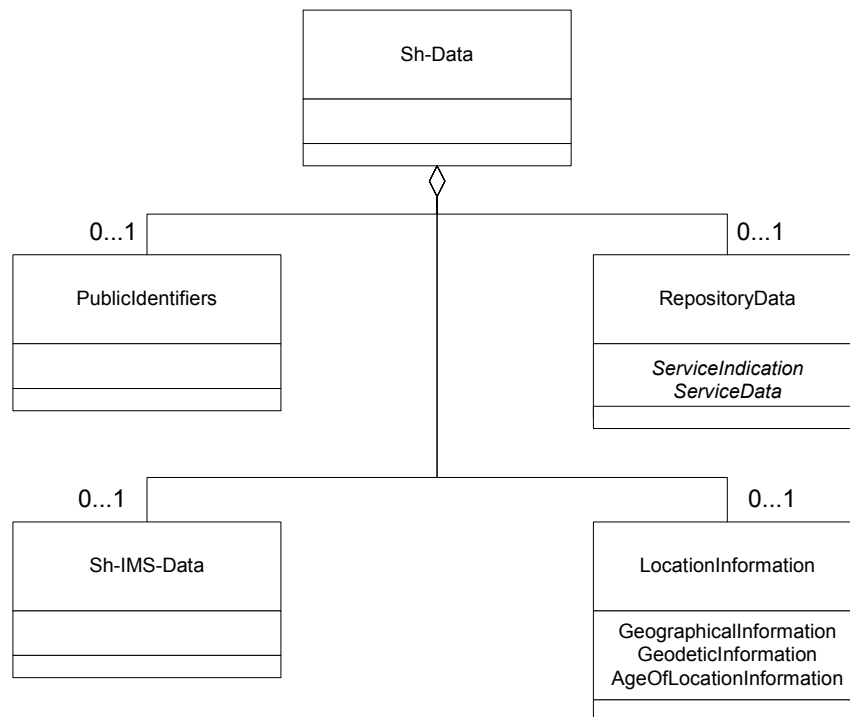
1

## 2 **Annex C (informative): UML model of the data downloaded over** 3 **Sh i/f**

4 The purpose of this UML model is to define in an abstract level the structure of the data downloaded over  
5 the Sh interface and describe the purpose of the different information classes included in it.

### 6 **C.1 General description**

7 The following picture gives an outline of the UML model of the user profile, which is exchanged between  
8 the HSS and an AS:



9

10 **Figure C.1.1: Sh-Data**

11 Each instance of the Sh-Data class contains 0 or 1 instance of the class PublicIdentifiers, 0 or 1 instance of  
12 the class Repository, 0 or 1 instance of the class Sh-IMS-Data.

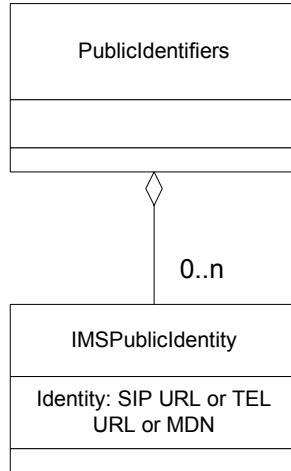
13 Class RepositoryData contains repository data (transparent data) for a given service. It has attributes  
14 ServiceIndication, SequenceNumber and ServiceData.

15

16

### 17 **C.2 PublicIdentifiers**

18 The following picture details the UML model of the class PublicIdentifiers:



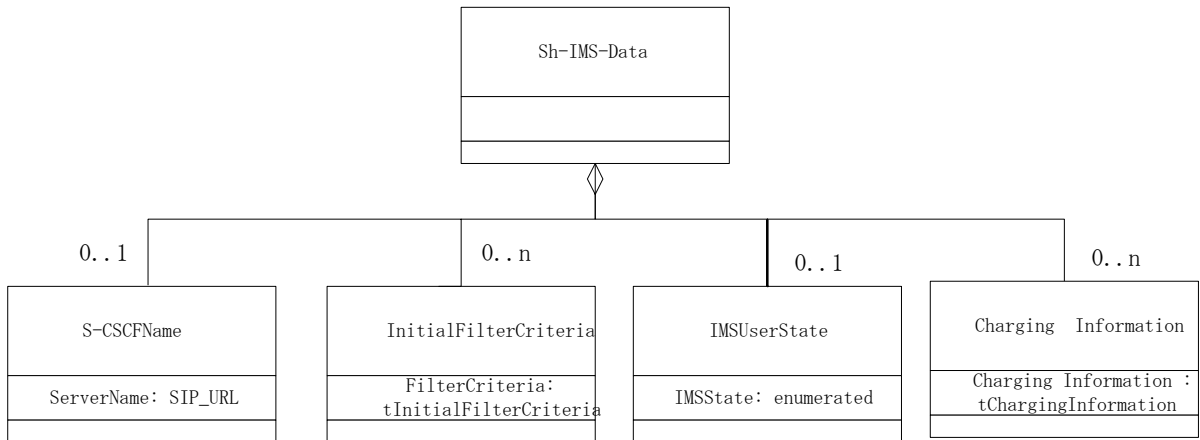
1  
2

**Figure C.2.1: The UML model of the class PublicIdentifiers**

3 Class PublicIdentifiers contains 0 to n user public identities. The identifiers are of format SIP URL, TEL  
4 URL or MDN.

### 5 C.3 Sh-IMS-Data

6 The following picture details the UML model of the class Sh-IMS-Data.  
7



8  
9

**Figure C.3.1: Sh-IMS-Data**

10 Each instance of the class Sh-IMS-Data contains 0 or 1 instance of the class S-CSCFName, 0 to n instances  
11 of the class InitialFilterCriteria, 0 to n instance of the class Charging Information and/or 0 or 1 instance or  
12 the IMSUserState class.

13 Class S-CSCFName contains the SIP URL of the S-CSCF where the multimedia public identity that the AS  
14 included in the request is registered.

15 Class InitialFilterCriteria is defined in [6] and contains the initial filter criteria of the multimedia public  
16 identity that the AS included in the request.

- 1 Class IMSUserState contains the registration state of the identity given by the attribute of class Sh-IMS-
- 2 Data. See chapter 7.6 for possible values.
- 3 Class Charging Information contains the online and offline charging function addresses. See chapter 7.6 for
- 4 possible values.
- 5

1

2 **Annex D (normative):**  
3 **XML schema for the Sh interface user profile**

4 The file ShDataType.xsd, attached to this specification, contains the XML schema for the Sh interface user  
5 profile. Such XML schema details all the data types on which XML documents containing Sh profile  
6 information shall be based. The XML schema file is intended to be used by an XML parser.

7 Tables D.1 and D.2 describe the data types and the dependencies among them that configure the XML  
8 schema.

1

**Table D.1: XML schema for Sh interface: simple data types**

<b>Data type</b>	<b>Tag</b>	<b>Base type</b>	<b>Comments</b>
tPriority	Priority	integer	>= 0
tGroupID	Group	integer	>= 0
tDefaultHandling	DefaultHandling	enumerated	Possible values: 0 (SESSION_CONTINUED) 1 (SESSION_TERMINATED)
tDirectionOfRequest	SessionCase	enumerated	Possible values: 0 (ORIGINATING_SESSION) 1 TERMINATING_SESSION 2 (TERMINATING_UNREGISTERED)
tIMSUserState	IMSUserState	Enumerated	Possible values: 0 (NOT_REGISTERED) 1 (REGISTERED) 2 (REGISTERED_UNREG_SERVICES) 3 (AUTHENTICATION_PENDING)
tCSUserState	CSUserState	Enumerated	Possible values (as defined in 3GPP TS 23.078): 0 (CAMELBusy) 1 (NetworkDeterminedNotReachable) 2 (AssumedIdle) 3 (NotProvidedfromVLR)
tPSUserState	PSUserState	Enumerated	Possible values (as defined in 3GPP TS 23.078): 0 (Detached) 1 (AttachedNotReachableForPaging) 2 (AttachedReachableForPaging) 3 (ConnectedNotReachableForPaging)

			4 (ConnectedReachableForPaging) 5 (NotProvidedFromSGSN)
tLocationNumber	LocationNumber	string	Syntax described in ITU-T Q.763 (base 64 encoded according to RFC 2045). Length $\geq 4$ and $\leq 16$ (multiples of 4).
tGlobalCellId	GlobalCellId	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 12.
tServiceAreaId	ServiceAreaId	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 12.
tLocationAreaId	LocationAreaId	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 8.
tRoutingAreaId	RoutingAreaId	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 8.
tGeographicalInformation	GeographicalInformation	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 12.
tGeodeticInformation	GeodeticInformation	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length = 16.
tAgeOfLocationInformation	AgeOfLocationInformation	integer	$\geq 0$ , $\leq 32767$
tAddressString	AddressString	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length $\geq 4$ and $\leq 28$ (multiples of 4).
tMSISDN	MSISDN	string	Syntax described in 3GPP TS 23.003.
tSIP_URL	PublicIdentity	anyURI	Syntax described in [9]
tTEL_URL	PublicIdentity	anyURI	Syntax described in [10]

tDiameterURI	DiameterURI	string	Syntax of a Diameter URI as described in [7]
tIMSPublicIdentity	IMSPublicIdentity	(union)	Union of tSIP_URL and tTEL_URL
tServiceInfo	ServiceInfo	string	
tString	Method, Header, Content, Line	string	
tBool	ConditionTypeCNF, ConditionNegated	boolean	Possible values: 0 (false) 1 (true)
tSequenceNumber	SequenceNumber	integer	>=0, <=65535

1

2

**Table D.2: XML schema for Sh interface: complex data types**

Data type	Tag	Compound of		
		Tag	Type	Cardinality
tSh-Data	Sh-Data	PublicIdentifiers	tPublicIdentity	0 to 1
		RepositoryData	tTransparentData	0 to 1
		Sh-IMS-Data	tShIMSData	0 to 1
		LocationInformation	tLocationInformation	0 to 1
tTransparentData	RepositoryData	ServiceIndication	string	0 to 1
		SequenceNumber	tSequenceNumber	1
		ServiceData	string	1
tShIMSData	Sh-IMS-Data	SCSCFName	tSIP_URL	0 to 1
		InitialFilterCriteria	tInitialFilterCriteria	0 to n
		IMSUserState	tIMSUserState	0 to 1
		ChargingInformation	tChargingInformation	0 to 1

tCSLocationInformation	CSLocationInformation	LocationNumber	tLocationNumber	0 to 1
		CellGlobalId	tGlobalCellId	0 to 1
		ServiceAreaId	tServiceAreaId	0 to 1
		LocationAreaId	tLocationAreaId	0 to 1
		GeographicalInformation	tGeographicalInformation	0 to 1
		GeodeticInformation	tGeodeticInformation	0 to 1
		VLRNumber	tISDNAddress	0 to 1
		MSCNumber	tISDNAddress	0 to 1
		CurrentLocationRetrieved	tBool	0 to 1
		AgeOfLocationInformation	tAgeOfLocationInformation	0 to 1
tPSLocationInformation	PSLocationInformation	CellGlobalId	tGlobalCellId	0 to 1
		ServiceAreaId	tServiceAreaId	0 to 1
		LocationAreaId	tLocationAreaId	0 to 1
		RoutingAreaId	tRoutingAreaId	0 to 1
		GeographicalInformation	tGeographicalInformation	0 to 1
		GeodeticInformation	tGeodeticInformation	0 to 1
		SGSNNumber	tISDNAddress	0 to 1

		CurrentLocationRetrieved	tBool	0 to 1	
		AgeOfLocationInformation	tAgeOfLocationInformation	0 to 1	
tPublicIdentity	PublicIdentity	IMSPublicIdentity	tIMSPublicIdentity	0 to n	
		MSISDN	tMSISDN	0 to n	
tInitialFilterCriteria	InitialFilterCriteria	Priority	tPriority	1	
		TriggerPoint	tTrigger	0 to 1	
		ApplicationServer	tApplicationServer	1	
tTrigger	TriggerPoint	ConditionTypeCNF	tBool	1	
		SPT	tSePoTri	0 to n	
SePoTri	SPT	ConditionNegated	tBool	0 to 1	
		Group	tGroupID	1 to n	
		Choice of	RequestURI	tString	1
			Method	tString	1
			SIPHeader	tHeader	1
			SessionCase	tDirectionOfRequest	1
			SessionDescription	tSessionDescription	1
tHeader	SIPHeader	Header	tString	1	
		Content	tString	0 to 1	
tSessionDescription	SessionDescription	Line	tString	1	
		Content	tString	0 to 1	
tApplicationServer	ApplicationServer	ServerName	tSIP_URL	1	

		DefaultHandling	tDefaultHandling	0 to 1
		ServiceInfo	tServiceInfo	0 to 1
tChargingInformation	ChargingInformation	PrimaryEventChargingFunctionName	tDiameterURI	1
		SecondaryEventChargingFunctionName	tDiameterURI	1
		PrimaryChargingCollectionFunctionName	tDiameterURI	1
		SecondaryChargingCollectionFunctionName	tDiameterURI	1

**NOTE: “n” shall be interpreted as non-bounded.**

1

2

## 1 Annex E (ShDataType.xsd):

```

2
3 <?xml version="1.0" encoding="UTF-8"?>
4 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
5 elementFormDefault="qualified" attributeFormDefault="unqualified">
6   <xs:simpleType name="tSIP_URL" final="list restriction">
7     <xs:restriction base="xs:anyURI"/>
8   </xs:simpleType>
9   <xs:simpleType name="tTEL_URL" final="list restriction">
10    <xs:restriction base="xs:anyURI"/>
11  </xs:simpleType>
12  <xs:simpleType name="tDiameterURI" final="list restriction">
13    <xs:restriction base="xs:anyURI"/>
14  </xs:simpleType>
15  <xs:simpleType name="tIMSPublicIdentity" final="#all">
16    <xs:union memberTypes="tSIP_URL tTEL_URL"/>
17  </xs:simpleType>
18  <xs:simpleType name="tServiceInfo" final="list restriction">
19    <xs:restriction base="xs:string">
20      <xs:minLength value="0"/>
21    </xs:restriction>
22  </xs:simpleType>
23  <xs:simpleType name="tString" final="list restriction">
24    <xs:restriction base="xs:string">
25      <xs:minLength value="0"/>
26    </xs:restriction>
27  </xs:simpleType>
28  <xs:simpleType name="tMSISDN" final="list restriction">
29    <xs:restriction base="xs:string">
30      <xs:minLength value="0"/>
31    </xs:restriction>
32  </xs:simpleType>
33  <xs:simpleType name="tIMSUserState" final="list restriction">
34    <xs:restriction base="xs:unsignedByte">
35      <xs:maxInclusive value="3"/>
36      <xs:enumeration value="0">
37        <xs:annotation>
38          <xs:documentation>
39            <label
40 xml:lang="en">NOT_REGISTERED</label>
41              <definition xml:lang="en">Not
42 registered</definition>
43            </xs:documentation>
44          </xs:annotation>
45        </xs:enumeration>
46      <xs:enumeration value="1">
47        <xs:annotation>
48          <xs:documentation>
49            <label
50 xml:lang="en">REGISTERED</label>
51              <definition
52 xml:lang="en">Registered</definition>
53            </xs:documentation>
54          </xs:annotation>
55        </xs:enumeration>

```

```

1         <xs:enumeration value="2">
2             <xs:annotation>
3                 <xs:documentation>
4                     <label
5 xml:lang="en">REGISTERED_UNREG_SERVICES</label>
6                     <definition
7 xml:lang="en">Registered, with services for unregistered</definition>
8                 </xs:documentation>
9             </xs:annotation>
10        </xs:enumeration>
11        <xs:enumeration value="3">
12            <xs:annotation>
13                <xs:documentation>
14                    <label
15 xml:lang="en">AUTHENTICATION_PENDING </label>
16                    <definition xml:lang="en">Pending
17 of authentication</definition>
18                </xs:documentation>
19            </xs:annotation>
20        </xs:enumeration>
21    </xs:restriction>
22 </xs:simpleType>
23 <xs:simpleType name="tCSUserState" final="list restriction">
24     <xs:restriction base="xs:unsignedByte">
25         <xs:maxInclusive value="3"/>
26         <xs:enumeration value="0">
27             <xs:annotation>
28                 <xs:documentation>
29                     <label
30 xml:lang="en">CAMELBusy</label>
31                 </xs:documentation>
32             </xs:annotation>
33         </xs:enumeration>
34         <xs:enumeration value="1">
35             <xs:annotation>
36                 <xs:documentation>
37                     <label
38 xml:lang="en">NetworkDeterminedNotReachable</label>
39                 </xs:documentation>
40             </xs:annotation>
41         </xs:enumeration>
42         <xs:enumeration value="2">
43             <xs:annotation>
44                 <xs:documentation>
45                     <label
46 xml:lang="en">AssumedIdle</label>
47                 </xs:documentation>
48             </xs:annotation>
49         </xs:enumeration>
50         <xs:enumeration value="3">
51             <xs:annotation>
52                 <xs:documentation>
53                     <label
54 xml:lang="en">NotProvidedFromVLR</label>
55                 </xs:documentation>
56             </xs:annotation>
57         </xs:enumeration>

```

```

1         </xs:restriction>
2     </xs:simpleType>
3     <xs:simpleType name="tPSUserState" final="list restriction">
4         <xs:restriction base="xs:unsignedByte">
5             <xs:maxInclusive value="5"/>
6             <xs:enumeration value="0">
7                 <xs:annotation>
8                     <xs:documentation>
9                         <label xml:lang="en">Detached
10 </label>
11                     </xs:documentation>
12                 </xs:annotation>
13             </xs:enumeration>
14             <xs:enumeration value="1">
15                 <xs:annotation>
16                     <xs:documentation>
17                         <label
18 xml:lang="en">AttachedNotReachableForPaging</label>
19                     </xs:documentation>
20                 </xs:annotation>
21             </xs:enumeration>
22             <xs:enumeration value="2">
23                 <xs:annotation>
24                     <xs:documentation>
25                         <label
26 xml:lang="en">AttachedReachableForPaging</label>
27                     </xs:documentation>
28                 </xs:annotation>
29             </xs:enumeration>
30             <xs:enumeration value="3">
31                 <xs:annotation>
32                     <xs:documentation>
33                         <label
34 xml:lang="en">ConnectedNotReachableForPaging</label>
35                     </xs:documentation>
36                 </xs:annotation>
37             </xs:enumeration>
38             <xs:enumeration value="4">
39                 <xs:annotation>
40                     <xs:documentation>
41                         <label
42 xml:lang="en">ConnectedReachableForPaging</label>
43                     </xs:documentation>
44                 </xs:annotation>
45             </xs:enumeration>
46             <xs:enumeration value="5">
47                 <xs:annotation>
48                     <xs:documentation>
49                         <label
50 xml:lang="en">notProvidedFromSGSN</label>
51                     </xs:documentation>
52                 </xs:annotation>
53             </xs:enumeration>
54         </xs:restriction>
55     </xs:simpleType>
56     <xs:simpleType name="tLocationNumber" final="list restriction">
57         <xs:restriction base="xs:string">

```

```

1         <xs:minLength value="4"/>
2         <xs:maxLength value="16"/>
3     </xs:restriction>
4 </xs:simpleType>
5 <xs:simpleType name="tCellGlobalId" final="list restriction">
6     <xs:restriction base="xs:string">
7         <xs:length value="12"/>
8     </xs:restriction>
9 </xs:simpleType>
10 <xs:simpleType name="tServiceAreaId" final="list restriction">
11     <xs:restriction base="xs:string">
12         <xs:length value="12"/>
13     </xs:restriction>
14 </xs:simpleType>
15 <xs:simpleType name="tLocationAreaId" final="list restriction">
16     <xs:restriction base="xs:string">
17         <xs:length value="8"/>
18     </xs:restriction>
19 </xs:simpleType>
20 <xs:simpleType name="tRoutingAreaId" final="list restriction">
21     <xs:restriction base="xs:string">
22         <xs:length value="8"/>
23     </xs:restriction>
24 </xs:simpleType>
25 <xs:simpleType name="tGeographicalInformation" final="list
26 restriction">
27     <xs:restriction base="xs:string">
28         <xs:length value="12"/>
29     </xs:restriction>
30 </xs:simpleType>
31 <xs:simpleType name="tGeodeticInformation" final="list
32 restriction">
33     <xs:restriction base="xs:string">
34         <xs:length value="16"/>
35     </xs:restriction>
36 </xs:simpleType>
37 <xs:simpleType name="tAddressString" final="list restriction">
38     <xs:restriction base="xs:string">
39         <xs:minLength value="4"/>
40         <xs:maxLength value="28"/>
41     </xs:restriction>
42 </xs:simpleType>
43 <xs:simpleType name="tSelectedLSAIdentity" final="list
44 restriction">
45     <xs:restriction base="xs:string">
46         <xs:length value="4"/>
47     </xs:restriction>
48 </xs:simpleType>
49 <xs:simpleType name="tPriority" final="list restriction">
50     <xs:restriction base="xs:int">
51         <xs:minInclusive value="0"/>
52     </xs:restriction>
53 </xs:simpleType>
54 <xs:simpleType name="tGroupID" final="list restriction">
55     <xs:restriction base="xs:int">
56         <xs:minInclusive value="0"/>
57 </xs:restriction>

```

```

1      </xs:simpleType>
2      <xs:simpleType name="tID" final="list restriction">
3          <xs:restriction base="xs:int">
4              <xs:minInclusive value="0"/>
5          </xs:restriction>
6      </xs:simpleType>
7      <xs:simpleType name="tDirectionOfRequest" final="list
8 restriction">
9          <xs:restriction base="xs:unsignedByte">
10             <xs:maxInclusive value="3"/>
11             <xs:enumeration value="0">
12                 <xs:annotation>
13                     <xs:documentation>
14                         <label
15 xml:lang="en">ORIGINATING_SESSION</label>
16                         <definition
17 xml:lang="en">Originating Session</definition>
18                     </xs:documentation>
19                 </xs:annotation>
20             </xs:enumeration>
21             <xs:enumeration value="1">
22                 <xs:annotation>
23                     <xs:documentation>
24                         <label
25 xml:lang="en">TERMINATING_SESSION</label>
26                         <definition
27 xml:lang="en">Terminating Session</definition>
28                     </xs:documentation>
29                 </xs:annotation>
30             </xs:enumeration>
31             <xs:enumeration value="2">
32                 <xs:annotation>
33                     <xs:documentation>
34                         <label
35 xml:lang="en">TERMINATING_UNREGISTERED</label>
36                         <definition
37 xml:lang="en">Terminating Session for unregistered user</definition>
38                     </xs:documentation>
39                 </xs:annotation>
40             </xs:enumeration>
41         </xs:restriction>
42     </xs:simpleType>
43     <xs:simpleType name="tDefaultHandling" final="list restriction">
44         <xs:restriction base="xs:unsignedByte">
45             <xs:maxInclusive value="1"/>
46             <xs:enumeration value="0">
47                 <xs:annotation>
48                     <xs:documentation>
49                         <label
50 xml:lang="en">SESSION_CONTINUED</label>
51                         <definition xml:lang="en">Session
52 Continued</definition>
53                     </xs:documentation>
54                 </xs:annotation>
55             </xs:enumeration>
56             <xs:enumeration value="1">
57                 <xs:annotation>

```

```

1             <xs:documentation>
2                 <label
3 xml:lang="en">SESSION_TERMINATED</label>
4                 <definition xml:lang="en">Session
5 Terminated</definition>
6             </xs:documentation>
7         </xs:annotation>
8     </xs:enumeration>
9 </xs:restriction>
10 </xs:simpleType>
11 <xs:simpleType name="tAgeOfLocationInformation" final="list
12 restriction">
13     <xs:restriction base="xs:int">
14         <xs:minInclusive value="0"/>
15         <xs:maxInclusive value="32767"/>
16     </xs:restriction>
17 </xs:simpleType>
18 <xs:simpleType name="tBool">
19     <xs:restriction base="xs:boolean"/>
20 </xs:simpleType>
21 <xs:simpleType name="tSequenceNumber" final="list restriction">
22     <xs:restriction base="xs:int">
23         <xs:minInclusive value="0"/>
24         <xs:maxInclusive value="65535"/>
25     </xs:restriction>
26 </xs:simpleType>
27 <xs:complexType name="tSh-Data">
28     <xs:sequence>
29         <xs:element name="PublicIdentifiers"
30 type="tPublicIdentity" minOccurs="0"/>
31         <xs:element name="RepositoryData"
32 type="tTransparentData" minOccurs="0"/>
33         <xs:element name="Sh-IMS-Data" type="tShIMSData"
34 minOccurs="0"/>
35         <xs:element name="CSLocationInformation"
36 type="tCSLocationInformation" minOccurs="0"/>
37         <xs:element name="PSLocationInformation"
38 type="tPSLocationInformation" minOccurs="0"/>
39         <xs:element name="CSUserState" type="tCSUserState"
40 minOccurs="0"/>
41         <xs:element name="PSUserState" type="tPSUserState"
42 minOccurs="0"/>
43         <xs:any namespace="##Other" processContents="lax"
44 minOccurs="0" maxOccurs="unbounded"/>
45     </xs:sequence>
46 </xs:complexType>
47 <xs:complexType name="tTransparentData">
48     <xs:sequence>
49         <xs:element name="ServiceIndication" type="tString"/>
50         <xs:element name="SequenceNumber"
51 type="tSequenceNumber"/>
52         <xs:element name="ServiceData">
53             <xs:complexType>
54                 <xs:sequence>
55                     <xs:any namespace="##Other"
56 processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
57                 </xs:sequence>

```

```

1           </xs:complexType>
2           </xs:element>
3       </xs:sequence>
4   </xs:complexType>
5   <xs:complexType name="tShIMSData">
6       <xs:sequence>
7           <xs:element name="SCSCFName" type="tSIP_URL"
8   minOccurs="0"/>
9           <xs:element name="InitialFilterCriteria"
10  type="tInitialFilterCriteria" minOccurs="0" maxOccurs="unbounded"/>
11          <xs:element name="IMSUserState" type="tIMSUserState"
12  minOccurs="0"/>
13          <xs:element name="ChargingInformation"
14  type="tChargingInformation" minOccurs="0"/>
15          <xs:any namespace="##Other" processContents="lax"
16  minOccurs="0" maxOccurs="unbounded"/>
17      </xs:sequence>
18  </xs:complexType>
19  <xs:complexType name="tCSLocationInformation">
20      <xs:sequence>
21          <xs:element name="LocationNumber"
22  type="tLocationNumber" minOccurs="0"/>
23          <xs:choice>
24              <xs:element name="CellGlobalId"
25  type="tCellGlobalId" minOccurs="0"/>
26              <xs:element name="ServiceAreaId"
27  type="tServiceAreaId" minOccurs="0"/>
28              <xs:element name="LocationAreaId"
29  type="tLocationAreaId" minOccurs="0"/>
30          </xs:choice>
31          <xs:element name="GeographicalInformation"
32  type="tGeographicalInformation" minOccurs="0"/>
33          <xs:element name="GeodeticInformation"
34  type="tGeodeticInformation" minOccurs="0"/>
35          <xs:element name="VLRNumber" type="tISDNAddress"
36  minOccurs="0"/>
37          <xs:element name="MSCNumber" type="tISDNAddress"
38  minOccurs="0"/>
39          <xs:element name="CurrentLocationRetrieved"
40  type="tBool" minOccurs="0"/>
41          <xs:element name="AgeOfLocationInformation"
42  type="tAgeOfLocationInformation" minOccurs="0"/>
43          <xs:any namespace="##Other" processContents="lax"
44  minOccurs="0" maxOccurs="unbounded"/>
45      </xs:sequence>
46  </xs:complexType>
47  <xs:complexType name="tPSLocationInformation">
48      <xs:sequence>
49          <xs:choice>
50              <xs:element name="CellGlobalId"
51  type="tCellGlobalId" minOccurs="0"/>
52              <xs:element name="ServiceAreaId"
53  type="tServiceAreaId" minOccurs="0"/>
54              <xs:element name="LocationAreaId"
55  type="tLocationAreaId" minOccurs="0"/>
56          </xs:choice>

```

```

1         <xs:element name="RoutingAreaId"
2 type="tRoutingAreaId" minOccurs="0"/>
3         <xs:element name="GeographicalInformation"
4 type="tGeographicalInformation" minOccurs="0"/>
5         <xs:element name="GeodeticInformation"
6 type="tGeodeticInformation" minOccurs="0"/>
7         <xs:element name="SGSNNNumber" type="tISDNAddress"
8 minOccurs="0"/>
9         <xs:element name="CurrentLocationRetrieved"
10 type="tBool" minOccurs="0"/>
11        <xs:element name="AgeOfLocationInformation"
12 type="tAgeOfLocationInformation" minOccurs="0"/>
13        <xs:any namespace="##Other" processContents="lax"
14 minOccurs="0" maxOccurs="unbounded"/>
15    </xs:sequence>
16 </xs:complexType>
17 <xs:complexType name="tISDNAddress">
18     <xs:sequence>
19         <xs:element name="Address" type="tAddressString"
20 maxOccurs="9"/>
21     </xs:sequence>
22 </xs:complexType>
23 <xs:complexType name="tPublicIdentity">
24     <xs:sequence>
25         <xs:element name="IMSPublicIdentity"
26 type="tIMSPublicIdentity" minOccurs="0" maxOccurs="unbounded"/>
27         <xs:element name="MSISDN" type="tMSISDN"
28 minOccurs="0" maxOccurs="unbounded"/>
29     </xs:sequence>
30 </xs:complexType>
31 <xs:complexType name="tInitialFilterCriteria">
32     <xs:sequence>
33         <xs:element name="Priority" type="tPriority"/>
34         <xs:element name="TriggerPoint" type="tTrigger"
35 minOccurs="0"/>
36         <xs:element name="ApplicationServer"
37 type="tApplicationServer"/>
38         <xs:any namespace="##Other" processContents="lax"
39 minOccurs="0" maxOccurs="unbounded"/>
40     </xs:sequence>
41 </xs:complexType>
42 <xs:complexType name="tTrigger">
43     <xs:sequence>
44         <xs:element name="ConditionTypeCNF" type="tBool"/>
45         <xs:element name="SPT" type="tSePoTri" minOccurs="0"
46 maxOccurs="unbounded"/>
47         <xs:any namespace="##Other" processContents="lax"
48 minOccurs="0" maxOccurs="unbounded"/>
49     </xs:sequence>
50 </xs:complexType>
51 <xs:complexType name="tSePoTri">
52     <xs:sequence>
53         <xs:element name="ConditionNegated" type="tBool"
54 minOccurs="0"/>
55         <xs:element name="Group" type="tGroupID"
56 maxOccurs="unbounded"/>
57     </xs:choice>

```

```

1         <xs:element name="RequestURI" type="tString"/>
2         <xs:element name="Method" type="tString"/>
3         <xs:element name="SIPHeader" type="tHeader"/>
4         <xs:element name="SessionCase"
5 type="tDirectionOfRequest"/>
6         <xs:element name="SessionDescription"
7 type="tSessionDescription"/>
8     </xs:choice>
9     <xs:any namespace="##Other" processContents="lax"
10 minOccurs="0" maxOccurs="unbounded"/>
11 </xs:sequence>
12 </xs:complexType>
13 <xs:complexType name="tSessionDescription">
14     <xs:sequence>
15         <xs:element name="Line" type="tString"/>
16         <xs:element name="Content" type="tString"
17 minOccurs="0"/>
18     </xs:sequence>
19 </xs:complexType>
20 <xs:complexType name="tHeader">
21     <xs:sequence>
22         <xs:element name="Header" type="tString"/>
23         <xs:element name="Content" type="tString"
24 minOccurs="0"/>
25     </xs:sequence>
26 </xs:complexType>
27 <xs:complexType name="tApplicationServer">
28     <xs:sequence>
29         <xs:element name="ServerName" type="tSIP_URL"/>
30         <xs:element name="DefaultHandling"
31 type="tDefaultHandling" minOccurs="0"/>
32         <xs:element name="ServiceInfo" type="tServiceInfo"
33 minOccurs="0"/>
34         <xs:any namespace="##Other" processContents="lax"
35 minOccurs="0" maxOccurs="unbounded"/>
36     </xs:sequence>
37 </xs:complexType>
38 <xs:complexType name="tChargingInformation">
39     <xs:sequence>
40         <xs:element name="PrimaryEventChargingFunctionName"
41 type="tDiameterURI"/>
42         <xs:element name="SecondaryEventChargingFunctionName"
43 type="tDiameterURI"/>
44         <xs:element
45 name="PrimaryChargingCollectionFunctionName" type="tDiameterURI"/>
46         <xs:element
47 name="SecondaryChargingCollectionFunctionName" type="tDiameterURI"/>
48     </xs:sequence>
49 </xs:complexType>
50 <xs:element name="Sh-Data" type="tSh-Data"/>
51 </xs:schema>
52
53

```