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*Technical Specification*

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
IP Multimedia Subsystem (IMS)  
Sh interface signalling flows and message contents  
(3GPP TS 29.328 version 5.9.0 Release 5)**



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## Foreword

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# 1 Scope

This 3GPP Technical Specification (TS) 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 3GPP TS 23.228 [1] and the signalling flows for the IP multimedia call control based on SIP and SDP are specified in 3GPP TS 24.228 [2].

The IP Multimedia (IM) Session Handling with the IP Multimedia (IM) call model is specified in 3GPP TS 23.218 [4].

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

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# 2 References

- [1] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem – Stage 2".
- [2] 3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP".
- [3] 3GPP TS 23.002 "Network architecture".
- [4] 3GPP TS 23.218: "IP Multimedia (IM) Session Handling; IP Multimedia (IM) call model"
- [5] 3GPP TS 29.329: "Sh Interface based on Diameter – Protocol details"
- [6] 3GPP TS 29.228: "IP multimedia (IM) Subsystem Cx Interface; Signalling flows and Message Elements".
- [7] 3GPP TS 29.229: "Cx and Dx Interfaces based on the Diameter protocol ; Protocol details"
- [8] IETF RFC 3588 "Diameter Base Protocol"
- [9] ITU-T recommendation Q.763: "Signalling System No. 7 - ISDN User Part formats and codes"
- [10] 3GPP TS 23.018: "Basic Call Handling; Technical realization"
- [11] 3GPP TS 23.003: "Numbering, Addressing and Identification"
- [12] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)"
- [13] 3GPP TS 29.002: "Mobile Application Part (MAP) specification"
- [14] 3GPP TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 - Stage 2"
- [15] RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies"
- [16] RFC 3261: "SIP: Session Initiation Protocol"
- [17] RFC 2806: "URLs for Telephone Calls"
- [18] TS 23.012: "Location Management Procedures"

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# 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.

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

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

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

## 3.2 Abbreviations

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

|        |                               |
|--------|-------------------------------|
| AS     | Application Server            |
| CSCF   | Call Session Control Function |
| C      | Conditional                   |
| HSS    | Home Subscriber Server        |
| IE     | Information Element           |
| IP     | Internet Protocol             |
| IM     | IP Multimedia                 |
| IMS    | IP Multimedia Subsystem       |
| M      | Mandatory                     |
| O      | Optional                      |
| SIP    | Session Initiation Protocol   |
| S-CSCF | Serving CSCF                  |

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## 4 Main Concept

This document presents the Sh 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.

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## 5 General Architecture

This clause further specifies the architectural assumptions associated with the Sh reference point, building on 3GPP TS 23.228 [1] and 3GPP TS 23.218 [4].

### 5.1 Functional requirements of network entities

#### 5.1.1 Functional Requirements of the Application Server

The Application Server may communicate with the HSS over the Sh interface.

For functionality of the Application Server refer to 3GPP TS 23.002 [3], 3GPP TS 23.228 [1] and 3GPP TS 23.218 [4].

#### 5.1.2 Functional requirements of HSS

The HSS may communicate with the Application Server over the Sh interface.

For functionality of the HSS refer to 3GPP TS 23.002 [3], 3GPP TS 23.228 [1] and 3GPP TS 23.218 [4].

### 5.2 Functional classification of Sh interface procedures

Operations on the Sh interface are classified in functional groups:



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

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## 6 Procedure Descriptions

In the tables that describe the Information Elements transported by each command, each Information Element is marked as (M) Mandatory, (C) Conditional or (O) Optional.

- A mandatory Information Element (marked as (M) in the table) shall always be present in the command. If this Information Element is absent, an application error occurs at the receiver and an answer message shall be sent back to the originator of the request with the Result-Code set to DIAMETER\_MISSING\_AVP. This message shall also include a Failed-AVP AVP containing the missing Information Element i.e. the corresponding Diameter AVP defined by the AVP Code and the other fields set as expected for this Information Element.
- A conditional Information Element (marked as (C) in the table) shall be present in the command if certain conditions are fulfilled.
  - If the receiver detects that those conditions are fulfilled and the Information Element is absent, an application error occurs and an answer message shall be sent back to the originator of the request with the Result-Code set to DIAMETER\_MISSING\_AVP. This message shall also include a Failed-AVP AVP containing the missing Information Element i.e. the corresponding Diameter AVP defined by the AVP Code and the other fields set as expected for this Information Element.
  - If those conditions are not fulfilled, the Information Element shall be absent. If however this Information Element appears in the message, it shall not cause an application error and it may be ignored by the receiver if this is not explicitly defined as an error case. Otherwise, an application error occurs at the receiver and an answer message with the Result-Code set to DIAMETER\_AVP\_NOT\_ALLOWED shall be sent back to the originator of the request. A Failed-AVP AVP containing a copy of the corresponding Diameter AVP shall be included in this message.
- An optional Information Element (marked as (O) in the table) may be present or absent in the command, at the discretion of the application at the sending entity. Absence or presence of this Information Element shall not cause an application error and may be ignored by the receiver.

### 6.1 User data handling procedures

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

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

- To read transparent and/or non-transparent data for a specified user from the HSS.

This procedure is mapped to the commands User-Data-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5]. Tables 6.1.1.1 and 6.1.1.2 detail the involved information elements.

Table 6.1.1.1: Sh-Pull

| Information element name              | Mapping to Diameter AVP | Cat. | Description   |
|---------------------------------------|-------------------------|------|---|
| User Identity (See 7.1)               | User-Identity           | M    | IMS Public User Identity or MSISDN of the user for whom the data is required.<br>See section 7.1 for the content of this AVP.   |
| 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 to the MSC/VLR and/or SGSN the need to initiate an active location retrieval.<br>Check table 7.6.1 to see when it is applicable. |
| Service Indication (See 7.4)          | Service-Indication      | C    | IE that identifies, together with the Public User Identity included in the User-Identity AVP and Data-Reference, the set of service related transparent data that is being requested.<br>Check table 7.6.1 to see when it is applicable.  |
| 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               | Server-Name             | C    | IE that is used, together with the IMS Public User Identity included in the User-Identity AVP and Data-Reference, as key to identify the filter criteria.<br>Check table 7.6.1 to see when it is applicable.  |

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.<br><br>Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.<br><br>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.   |

### 6.1.1.1 Detailed behaviour

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

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

1. Check that the AS sending the request (identified by the Origin-Host AVP) has Sh-Pull permission in the AS Permissions List (See 6.2). If not, Experimental-Result-Code shall be set to `DIAMETER_ERROR_OPERATION_NOT_ALLOWED` in the Sh-Pull Response.
2. Check that the user for whom data is asked exists in HSS. If not, Experimental-Result-Code shall be set to `DIAMETER_ERROR_USER_UNKNOWN` in the Sh-Pull Response.
3. Check that the requested user data is allowed to be read by the AS.
  - If the data referenced in the request is not allowed to be read, Experimental-Result Code shall be set to `DIAMETER_ERROR_USER_DATA_CANNOT_BE_READ` in the Sh-Pull Response.

4. Check whether or not the data that is requested to be downloaded by the AS is currently being updated by another entity. If there is an update of the data in progress, the HSS shall delay the Sh-Pull-Resp message until the update has been completed and shall include in the Sh-Pull-Resp message the updated data requested.

If there is an error in any of the above steps then the HSS shall stop processing and shall return the error code specified in the respective step (see 3GPP TS 29.329 [5] and 3GPP TS 29.229 [7] for an explanation of the error codes). Otherwise, the requested operation shall take place and the HSS shall return the Result-Code AVP set to DIAMETER\_SUCCESS and the requested data identified by User-Identity and Data-Reference in the Sh-Pull Response message.

## 6.1.2 Data Update (Sh-Update)

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

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

This procedure is mapped to the commands Profile-Update-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5]. Tables 6.1.2.1 and 6.1.2.2 detail the involved information elements.

**Table 6.1.2.1: Sh-Update**

| Information element name                 | Mapping to Diameter AVP | Cat. | Description   |
|--|-------------------------|------|---|
| User Identity<br>(See 7.1)               | User-Identity           | M    | IMS Public User Identity of the user which data is updated. See section 7.1 for the content of this AVP.  |
| Requested data<br>(See 7.3)              | Data-Reference          | M    | This information element includes the reference to the data on which updates are required ( <a href="#">possible values of the Data Reference</a> are defined in Table 7.6.1) |
| Data<br>(See 7.6)                        | User-Data               | M    | Updated data.   |
| Application Server Identity<br>(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.   |

**Table 6.1.2.2: Sh-Update Resp**

| Information element name | Mapping to Diameter AVP           | Cat. | Description   |
|--------------------------|-----------------------------------|------|---|
| Result<br>(See 7.5)      | Result-Code / Experimental-Result | M    | Result of the update of data in the HSS.<br><br>Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.<br><br>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. |

### 6.1.2.1 Detailed behaviour

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

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

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

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

1. Check that the AS sending the request (identified by the Origin-Host AVP) has Sh-Update permission in the AS Permissions List (See 6.2). If the AS does not have Sh-Update permission, Experimental-Result-Code shall be set to DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED in the Sh-Update Response.
2. Check that the user for whom data is asked to be updated exists in the HSS. If not, Experimental-Result-Code shall be set to DIAMETER\_ERROR\_USER\_UNKNOWN in the Sh-Update Response.
3. Check that the user data that is requested to be updated by the AS, is allowed to be updated. If the data is not allowed to be updated, Experimental-Result Code shall be set to DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_MODIFIED in the Sh-Update Response.
4. Check whether or not the data that is requested to be updated by the AS, as identified by the Service-Indication, is currently being updated by another entity. If there is an update of the data in progress, Experimental-Result Code shall be set to DIAMETER\_PRIOR\_UPDATE\_IN\_PROGRESS in the Sh-Update Response.
5. Check whether or not there is any repository data stored at the HSS already for the specified Service-Indication and the associated user.
  - If repository data identified by the Service-Indication is stored at the HSS for the specified user, check the following premises:
    1. Sequence\_Number\_in\_Sh\_Update is not equal to 0
    2. (Sequence\_Number\_in\_Sh\_Update - 1) is equal to (Sequence\_Number\_In\_HSS modulo 65535)
  - If either of the above premises is false then Experimental-Result-Code shall be set to DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC in the Sh-Update Response.
  - If both of the above premises are true, then check whether or not Service Data is received within the Sh-Update Req.
    - If Service Data is included in the Sh-Update Req, check whether or not the size of the data is greater than that which the HSS is prepared to accept.
      - If there is more data than the HSS is prepared to accept then Experimental-Result-Code shall be set to DIAMETER\_ERROR\_TOO\_MUCH\_DATA and the new data shall be discarded.
      - If the HSS is prepared to accept the data, then the repository data stored at the HSS shall be updated with the repository data sent in the Sh-Update Req and the Sequence Number associated with that repository data shall be updated with that sent in the Sh-Update Req. This triggers the sending of Sh-Notif messages to any other ASs that are subscribed to Notifications for updates to the service data for that user (see 6.1.4).
    - If Service Data is not received, the data stored in the repository at the HSS shall be removed, and as a consequence the Service Indication and the Sequence Number associated with the removed data shall also be removed. This triggers the sending of Sh-Notif messages to any other ASs that are subscribed to Notifications for updates to the service data for that user (see 6.1.4). After sending Sh-Notif messages, the subscriptions to Notifications for the removed Repository Data shall be deleted.
  - If repository data identified by the Service-Indication is not stored for the user i.e. the Sh-Update Req intends to create a new repository data, check whether or not the Sequence Number in the Sh-Update Req is 0.
    - If the sequence number is not set to 0, Experimental-Result Code shall be set to DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC
    - If the sequence number is set to 0 check whether Service Data is included within the Sh-Update Req.
      - If Service Data is not included in the Sh-Update Req, then Experimental-Result-Code shall be set to DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED and the operation shall be ignored by the HSS.
      - If Service Data is included in the Sh-Update Req, check whether or not the size of the data is greater than that which the HSS is prepared to accept. If there is more data than the HSS is prepared to accept

then Experimental-Result-Code shall be set to DIAMETER\_ERROR\_TOO\_MUCH\_DATA and the new data shall be discarded.

- If the HSS is prepared to accept the data included in the Sh-Update Req, then the data shall be stored in within the data repository in the HSS.

If there is an error in any of the above steps then the HSS shall stop processing and shall return the error code specified in the respective step (see 3GPP TS 29.329 [5] and 3GPP TS 29.229 [7] for an explanation of the error codes).

Otherwise, the requested operation shall take place and the HSS shall return the Result-Code AVP set to DIAMETER\_SUCCESS.

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

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

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

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

This procedure is mapped to the commands Subscribe-Notifications-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5]. Tables 6.1.3.1 and 6.1.3.2 detail the information elements involved.

**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. See section 7.1 for the content of this AVP.  |
| 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      | C    | IE that identifies, together with the IMS Public User Identity and Data-Reference, the set of service related transparent data for which notifications of changes are requested. This element shall be present when the Data-Reference value is RepositoryData (0). |
| 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               | Server-Name             | C    | IE that is used, together with the IMS Public 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).  |

**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    | <p>Result of the request.</p> <p>Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.</p> <p>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.</p> |

### 6.1.3.1 Detailed behaviour

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

Upon reception of the Sh-Subs-Notif request, the HSS shall, in the following order (if there is an error in any of the following steps the HSS shall stop processing and return the corresponding error code, see 3GPP TS 29.329 [5] and 3GPP TS 29.229 [7]):

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

### 6.1.4 Notifications (Sh-Notif)

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

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

This procedure is mapped to the commands Push-Notification-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5]. Tables 6.1.4.1 and 6.1.4.2 detail the involved information elements.

**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 User Identity of the user which data has changed. See section 7.1 for the content of this AVP. |
| Requested Data (See 7. 6) | User-Data               | M    | Changed data.   |

**Table 6.1.4.2: Sh-Notif Resp**

| Information element name         | Mapping to Diameter AVP           | Cat. | Description   |
|----------------------------------|-----------------------------------|------|---|
| Data request result<br>(See 7.5) | Result-Code / Experimental-Result | M    | Result of the request.<br><br>Result-Code AVP shall be used for errors defined in the Diameter Base Protocol.<br><br>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. |

### 6.1.4.1 Detailed behaviour

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

## 6.2 AS permissions list

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

---

## 7 Information element contents

### 7.1 User Identity

This information element contains a user identity according to the conditions described in table 7.1.1.

**Table 7.1.1: User Identity content**

| Information element name                | Mapping to Diameter AVP | Cat. | Description  |
|---|-------------------------|------|--|
| IMS Public User Identity<br>(See 7.1.1) | Public-Identity         | C    | IMS Public User Identity of the user for whom the data is required. If the MSISDN is not included in the User-Identity AVP, the Public-Identity AVP shall be included in Sh messages only for allowed Data References as described in Table 7.6.1. |
| MSISDN<br>(See 7.1.2)                   | MSISDN                  | C    | MSISDN of the user for whom the data is required. If the Public-Identity AVP is not included in the User-Identity AVP, the MSISDN AVP shall be included in the Sh-Pull message only for allowed Data References as described in Table 7.6.1.       |

#### 7.1.1 IMS Public User Identity

This information element contains an IMS public user identity (either SIP-URI or TEL-URL).

#### 7.1.2 MSISDN

This information element contains a Basic MSISDN (see 3GPP TS 23.012 [18]).

## 7.2 Requested Domain

This information element details the access domains for which certain data (e.g. user state, location information) are requested. See 3GPP TS 29.329 [5] for the list of possible values.

## 7.3 Requested Data

- Reference to the data that an AS is requesting from the HSS.
- Reference to the data which, an AS wants to be notified of, when changed.
- Reference to data for which subscription to notification of change is rejected.

See chapter 7.6.

## 7.4 Service Indication

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

## 7.5 Result

This information element contains the result code of the operation. See 3GPP TS 29.329 [5] for the list of possible values.

## 7.6 Data

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

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

Table 7.6.1 defines the data reference values and tags, access key and recommended access rights for the the operation(s) on data accessible via the Sh interface, i.e. the listed operation(s) in the Operations column are the only ones allowed to be used with this Data Ref value. It is a matter of operator policy to further restrict the access rights defined in table 7.6.1.

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

| Data Ref. | XML tag               | Defined in | Access key   | Operations                        |
|-----------|-----------------------|------------|--|-----------------------------------|
| 0         | RepositoryData        | 7.6.1      | IMS Public User Identity + Data-Reference + Service-Indication | Sh-Pull, Sh-Update, Sh-Subs-Notif |
| 10        | IMSPublicIdentity     | 7.6.2      | IMS Public User Identity or MSISDN + Data-Reference            | Sh-Pull                           |
| 11        | IMSUserState          | 7.6.3      | IMS Public User Identity + Data-Reference                      | Sh-Pull, Sh-Subs-Notif            |
| 12        | S-CSCFName            | 7.6.4      |  | Sh-Pull, Sh-Subs-Notif            |
| 13        | InitialFilterCriteria | 7.6.5      | IMS Public User Identity + Data-Reference + Server-Name        | Sh-Pull, Sh-Subs-Notif            |
| 14        | LocationInformation   | 7.6.6      | MSISDN + Data-Reference+ Requested-Domain                      | Sh-Pull                           |
| 15        | UserState             | 7.6.7      |  |                                   |
| 16        | Charging information  | 7.6.8      | IMS Public User Identity or MSISDN + Data-Reference            | Sh-Pull                           |
| 17        | MSISDN                | 7.6.9      |  | Sh-Pull                           |



### 7.6.1 Repository Data

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

### 7.6.2 IMSPublicIdentity

This information element contains an IMS public identity that would be either:

- associated with the Private Identity of the subscriber for whom the IMS Public Identity is included in the request or
- associated with the MSISDN present in the request.

Multiple instances of this information element may be included in the message.

### 7.6.3 IMS User State

This information element contains the IMS User State of the public identifier referenced. Its possible values are:

- REGISTERED,
- NOT\_REGISTERED,
- AUTHENTICATION\_PENDING,
- REGISTERED\_UNREG\_SERVICES.

### 7.6.4 S-CSCF Name

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

### 7.6.5 Initial Filter Criteria

This information element contains the triggering information for a service.

For a more detailed description, refer to 3GPP TS 23.218 [4] and 3GPP TS 29.228 [6].

### 7.6.6 Location Information

This information element contains the location of the served subscriber in the MSC/VLR if the requested domain is CS, or the location of the served subscriber in the SGSN if the requested domain is PS. If the HSS has to communicate with the MSC/VLR and/or SGSN to retrieve location information, it shall make use of the service MAP-PROVIDE-SUBSCRIBER-INFO.

For both Location Information for CS and Location Information for GPRS, the considerations described in 3GPP TS 23.078 [14] apply.

#### 7.6.6.1 Location information for CS

This information element consists of the following subordinate information elements:

- Location number: defined in ITU-T Recommendation Q.763 [9]. Considerations described in 3GPP TS 23.018 apply[10].
- Service area ID: defined in 3GPP TS 23.003 [11].
- Global Cell ID: defined in 3GPP TS 23.003 [11].
- Location area ID: defined in 3GPP TS 23.003 [11].

- Geographical Information: defined in 3GPP TS 23.032 [12]. Considerations described in 3GPP TS 23.018 [10] and 3GPP TS 29.002 [13] apply.
- Geodetic Information: defined in ITU-T Recommendation Q.763 [9]. Considerations described in 3GPP TS 23.018 [10] and 3GPP TS 29.002 [13] apply.
- VLR Number: defined in 3GPP TS 23.003 [11].
- MSC Number: defined in 3GPP TS 23.003 [11].
- Age of location information: defined in 3GPP TS 23.018 [10].
- Current Location Retrieved: shall be present when location information was obtained after a successful paging procedure for Active Location Retrieval.

### 7.6.6.2 Location information for GPRS

This information element consists of the following subordinate information elements:

- Service area ID: defined in 3GPP TS 23.003 [11].
- Global Cell ID: defined in 3GPP TS 23.003 [11].
- Location area ID: defined in 3GPP TS 23.003 [11].
- Geographical Information: defined in 3GPP TS 23.032 [12]. Considerations described in 3GPP TS 23.018 [10] and 3GPP TS 29.002 [13] apply.
- Geodetic Information: defined in ITU-T Recommendation Q.763 [9]. Considerations described in 3GPP TS 23.018 [10] and 3GPP TS 29.002 [13] apply.
- SGSN Number: defined in 3GPP TS 23.003 [11].
- Routing Area ID: defined in 3GPP TS 23.003 [11].
- Current Location Retrieved: shall be present when location information was obtained after a successful paging procedure for Active Location Retrieval.

### 7.6.7 User state

This information element indicates the state of the user in the domain indicated by the Requested-Domain (see 7.2), with the values specified in 3GPP TS 23.078 [14] for Subscriber State and PS Domain Subscriber State. The HSS shall make use of the operation MAP-PROVIDE-SUBSCRIBER-INFO towards the MSC/VLR and/or the SGSN to obtain this information.

### 7.6.8 Charging information

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

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

### 7.6.9 MSISDN

This information element contains an MSISDN that is associated with the User Identity (Public Identity or MSISDN) present in the request. All valid instances of this information element shall be included in the message.

## 7.7 Subscription request type

This information element indicates the action requested for subscription to notifications. See 3GPP TS 29.329 [5] for the list of valid values.

## 7.8 Current Location

This information element indicates whether an active location retrieval has to be initiated or not when an AS requested location information. See 3GPP TS 29.329 [5] for the list of possible values.

## 7.9 Application Server Identity

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

## 7.10 Application Server Name

This information element indicates application server's SIP URI. See 3GPP TS 29.229 [7] for the detailed definition of the AVP.

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# 8 Protocol version identification

See 3GPP TS 29.329 [5].

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# 9 Operational Aspects

See 3GPP TS 29.329 [5].

---

# 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 3GPP TS 29.329 [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**

| <b>Sh message</b>  | <b>Source</b> | <b>Destination</b> | <b>Command-Name</b>             | <b>Abbreviation</b> |
|--------------------|---------------|--------------------|---------------------------------|---------------------|
| 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                 |

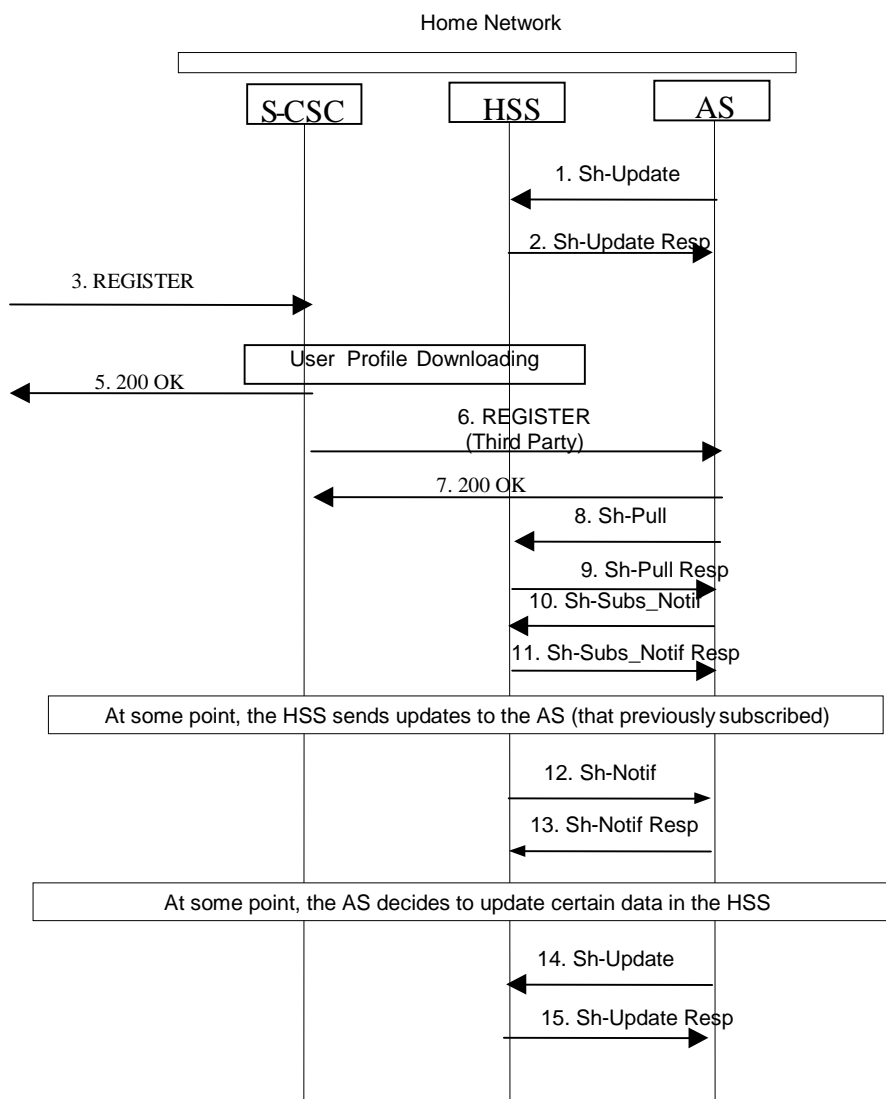
A.3 Void

# Annex B (informative): Message flow

## B.1 Message flows

The following message flows give examples regarding which Diameter messages shall be sent in scenarios described in 3GPP TS 23.218 [4].

### B.1.1 Data Update, Registration, Notification Subscription.



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

1. A user subscribes to a new service. The operator provisions the service in an AS. The AS stores some service data for a user in the HSS, Sh-Update (user identity, updated data) e.g. repository data.
2. HSS confirms the data is updated
3. Some time later, user registers with the network
4. S-CSCF downloads the data from the HSS (during the procedure S-CSCF Registration Notification on Cx interface). Filter criteria specify that the AS wants to be notified that the end user is registered.

5. 200 OK
6. S-CSCF sends third party registration message to the application server to notify that user is registered.
7. 200 OK
8. The AS downloads data needed for providing service from HSS, by means of Sh-Pull (user identity, requested data, and service information).
9. HSS sends data to AS
10. The AS subscribes to notifications from the HSS of changes in data, by means of Sh-Subs-Notif (user identity, requested data, and/or service information).
11. The HSS confirms the subscription request.
12. At some moment, user data is updated in the HSS. As the AS subscribed to notifications (step 10), the HSS sends to the AS the requested updates, by means of Sh-Notif (user identity, updated data).
13. The AS acknowledges the notification.
14. At some moment, the AS decides to update user"s service data e.g. repository data in the HSS, by means of Cx-Update (user identity, updated data).
15. The HSS confirms the service data is updated.

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

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

## C.1 General description

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

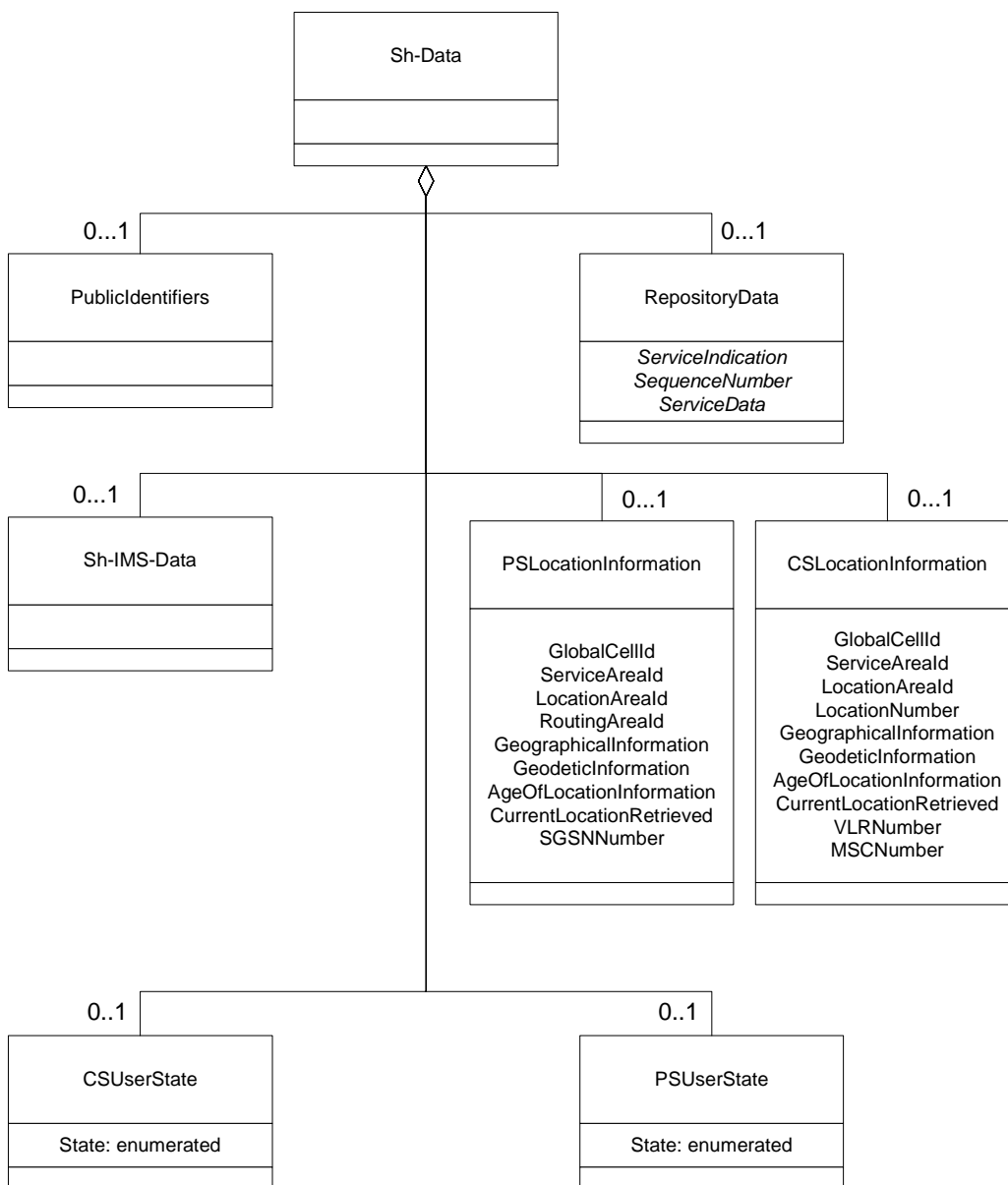


Figure C.1.1: Sh-Data

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

class PSUserState and/or 0 or 1 instance of the class CSLocationInformation or 0 or 1 instance of the class PSLocationInformation.

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

Class CSUserState contains the state of a user in the CS domain. Its only attribute, State, is an enumeration whose possible values are defined in chapter 7.6.7.

Class PSUserState contains the state of a user in the PS domain. Its only attribute, State, is an enumeration whose possible values are defined in chapter 7.6.7.

NOTE: the fact that attribute State is an enumeration is a difference from what can be carried in the MAP protocol.

Class CSLocationInformation has the attributes Location Number, Service Area ID, GlobalCellId, LocationAreaId, GeographicalInformation, GeodeticInformation, VLR Number, MSC Number, AgeOfLocationInformation and CurrentLocationRetrieved. They are defined in 7.6.

Class PSLocationInformation has the attributes ServiceAreaId, GlobalCellId, LocationAreaID, RoutingAreaID, GeographicalInformation, GeodeticInformation, SGSN Number, AgeOfLocationInformation and CurrentLocationRetrieved. They are defined in 7.6.

## C.2 PublicIdentifiers

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

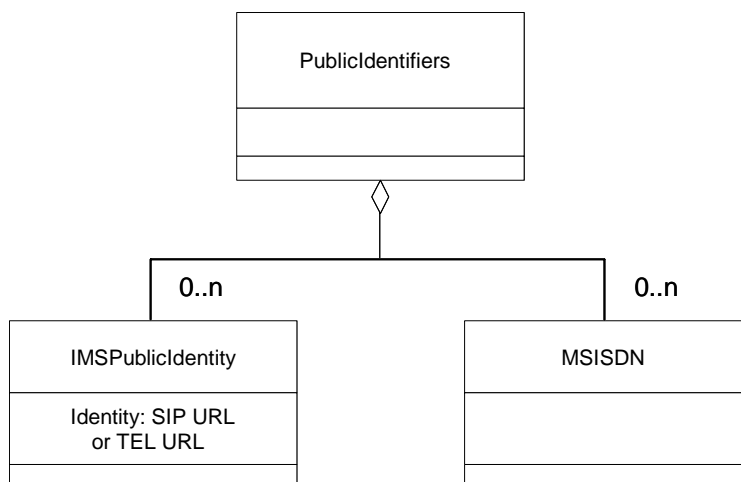


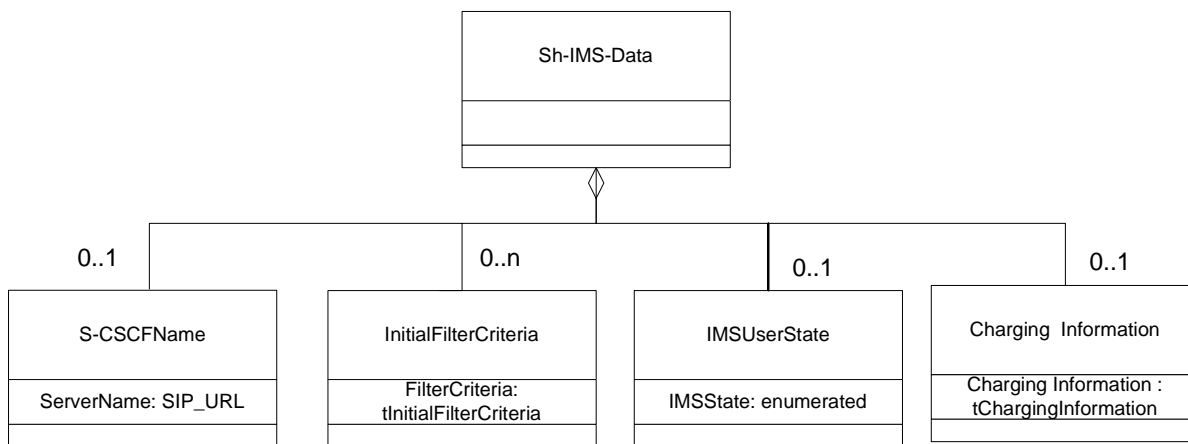
Figure C.2.1: The UML model of the class PublicIdentifiers

Class PublicIdentifiers contains 0 to n user public identities which may be either of class IMSPublicIdentity or of class MSISDN. The identifiers are of format SIP URL, TEL URL or MSISDN.

## C.3 Sh-IMS-Data

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





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

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

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

Class InitialFilterCriteria is defined in 3GPP TS 29.228 [6] and contains the initial filter criteria of the multimedia public identity that the AS included in the request.

Class IMSUserState contains the registration state of the identity given by the attribute of class Sh-IMS-Data. See chapter 7.6 for possible values.

Class Charging Information contains the online and offline charging function addresses. See chapter 7.6 for possible values.

---

## Annex D (normative): XML schema for the Sh interface user profile

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

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

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

| Data type           | Tag             | Base type  | Comments  |
|---------------------|-----------------|------------|---|
| tPriority           | Priority        | integer    | >= 0  |
| tGroupID            | Group           | integer    | >= 0  |
| tDefaultHandling    | DefaultHandling | enumerated | Possible values:<br>0 (SESSION_CONTINUED)<br>1 (SESSION_TERMINATED)   |
| tDirectionOfRequest | SessionCase     | enumerated | Possible values:<br>0 (ORIGINATING_SESSION)<br>1 TERMINATING_SESSION<br>2 (TERMINATING_UNREGISTERED)  |
| tIMSUserState       | IMSUserState    | Enumerated | Possible values:<br>0 (NOT_REGISTERED)<br>1 (REGISTERED)<br>2 (REGISTERED_UNREG_SERVICES)<br>3 (AUTHENTICATION_PENDING)   |
| tCSUserState        | CSUserState     | Enumerated | Possible values (as defined in 3GPP TS 23.078 [14]):<br>0 (CAMELBusy)<br>1 (NetworkDeterminedNotReachable)<br>2 (AssumedIdle)<br>3 (NotProvidedfromVLR)   |
| tPSUserState        | PSUserState     | Enumerated | Possible values (as defined in 3GPP TS 23.078 [14]):<br>0 (Detached)<br>1 (AttachedNotReachableForPaging)<br>2 (AttachedReachableForPaging)<br>3 (ConnectedNotReachableForPaging)<br>4 (ConnectedReachableForPaging)<br>5 (NotProvidedFromSGSN) |
| tLocationNumber     | LocationNumber  | string     | Syntax described in ITU-T Q.763 [9] (Base64)  |

|                           |   |         |   |
|---------------------------|---|---------|---|
|                           |   |         | encoded according to RFC 2045 [15]).<br>Length $\geq 4$ and $\leq 16$ (multiples of 4).   |
| tCellGlobalId             | CellGlobalId                                    | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length = 12.                                    |
| tServiceAreaId            | ServiceAreaId                                   | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length = 12.                                    |
| tLocationAreaId           | LocationAreaId                                  | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length = 8.                                     |
| tRoutingAreaId            | RoutingAreaId                                   | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length = 8.                                     |
| tGeographicalInformation  | GeographicalInformation                         | string  | Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045).<br>Length = 12.   |
| tGeodeticInformation      | GeodeticInformation                             | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length = 16.                                    |
| tAgeOfLocationInformation | AgeOfLocationInformation                        | integer | $\geq 0$ , $\leq 32767$   |
| tAddressString            | AddressString                                   | string  | Syntax described in 3GPP TS 29.002 [13] (Base64 encoded according to RFC 2045 [15]).<br>Length $\geq 4$ and $\leq 28$ (multiples of 4). |
| tMSISDN                   | MSISDN  | string  | Syntax described in 3GPP TS 23.003 [11].  |
| tSIP_URL                  | PublicIdentity                                  | anyURI  | Syntax described in RFC 3261 [16]   |
| tTEL_URL                  | PublicIdentity                                  | anyURI  | Syntax described in RFC 2806 [17]   |
| tDiameterURI              | DiameterURI                                     | string  | Syntax of a Diameter URI as described in IETF RFC 3588 [8]  |
| tIMSPublicIdentity        | IMSPublicIdentity                               | (union) | Union of tSIP_URL and tTEL_URL  |
| tServiceInfo              | ServiceInfo                                     | string  |   |
| tString                   | RequestURI,<br>Method, Header,<br>Content, Line | string  |   |

|                 |                                       |         |   |
|-----------------|---------------------------------------|---------|---|
| tBool           | ConditionTypeCNF,<br>ConditionNegated | boolean | Possible values:<br>0 (false)<br>1 (true) |
| tSequenceNumber | SequenceNumber                        | integer | >=0, <=65535                              |

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      |
|                        |                       |                         |                          |             |
|                        |                       | CSLocationInformation   | tCSLocationInformation   | 0 to 1      |
|                        |                       | PSLocationInformation   | tPSLocationInformation   | 0 to 1      |
|                        |                       | CSUserState             | tCSUserState             | 0 to 1      |
|                        |                       | PSUserState             | tPSUserState             | 0 to 1      |
| tTransparentData       | RepositoryData        | ServiceIndication       | string                   | 1           |
|                        |                       | SequenceNumber          | tSequenceNumber          | 1           |
|                        |                       | ServiceData             | tServiceData             | 0 to 1      |
| tServiceData           | any                   | any                     | any                      | 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            | tCellGlobalId            | 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             | tCellGlobalId             | 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        | PublicIdentifiers     | 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              |   |
| tSePoTri             | 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     | 0 to 1              |   |
|                      |                     | SecondaryEventChargingFunctionName      | tDiameterURI     | 0 to 1              |   |
|                      |                     | PrimaryChargingCollectionFunctionName   | tDiameterURI     | 1                   |   |
|                      |                     | SecondaryChargingCollectionFunctionName | tDiameterURI     | 0 to 1              |   |

NOTE: 'n' shall be interpreted as non-bounded.



Annex E:  
(void)

## Annex F (informative): Change history

| Change history |       |           |     |     |  |       |       |
|----------------|-------|-----------|-----|-----|--|-------|-------|
| Date           | TSG # | TSG Doc.  | CR  | Rev | Subject/Comment  | Old   | New   |
| Jun 2002       | CN#16 | NP-020277 |     |     | Version 2.0.0 approved at CN#16  | 2.0.0 | 5.0.0 |
| Sep 2002       | CN#17 | NP-020450 | 1   | 1   | The Correction of Section 7 Numbering and internal referencing                                       | 5.0.0 | 5.1.0 |
| Sep 2002       | CN#17 | NP-020450 | 2   | 1   | Correction of handling of subscriptions to notifications   | 5.0.0 | 5.1.0 |
| Sep 2002       | CN#17 | NP-020450 | 3   | 1   | Definition of User Location for Sh interface   | 5.0.0 | 5.1.0 |
| Sep 2002       | CN#17 | NP-020450 | 4   | 1   | Definition of User State for Sh interface  | 5.0.0 | 5.1.0 |
| Sep 2002       | CN#17 | NP-020450 | 5   |     | Missing references to XML schema for Sh interface  | 5.0.0 | 5.1.0 |
| Sep 2002       | CN#17 | NP-020450 | 6   |     | Extensibility of XML schema for Sh interface   | 5.0.0 | 5.1.0 |
| Dec 2002       | CN#18 | NP-020592 | 007 | -   | Removal of upper bounds in Sh i/f user profile and correction of mistake in XML schema documentation | 5.1.0 | 5.2.0 |
| Dec 2002       | CN#18 | NP-020593 | 008 | 1   | Clarification on update of repository data   | 5.1.0 | 5.2.0 |
| Dec 2002       | CN#18 | NP-020593 | 009 | 1   | Removing the DDF dependencies from Sh interface  | 5.1.0 | 5.2.0 |
| Dec 2002       | CN#18 | NP-020592 | 013 | 2   | Error handling in HSS when being updated with too much data  | 5.1.0 | 5.2.0 |
| Dec 2002       | CN#18 | NP-020591 | 014 | -   | Correction of the SPI  | 5.1.0 | 5.2.0 |
| Jan 2003       |       |           |     |     | Restoration of Annex E   | 5.2.0 | 5.2.1 |
| March 2003     | CN#19 | NP-030315 | 012 | 3   | Initial Filter Criteria  | 5.2.0 | 5.3.0 |
| March 2003     | CN#19 | NP-030022 | 015 | -   | Deletion of Annex E  | 5.2.0 | 5.3.0 |
| March 2003     | CN#19 | NP-030262 | 016 | 2   | Update after Diameter has become RFC   | 5.2.0 | 5.3.0 |
| March 2003     | CN#19 | NP-030266 | 017 | 1   | Correction to application server identity  | 5.2.0 | 5.3.0 |
| March 2003     | CN#19 | NP-030267 | 018 | 2   | Clarification on Sh interface for charging purposes  | 5.2.0 | 5.3.0 |
| March 2003     | CN#19 | NP-030268 | 019 | 2   | Change of SPI to SPT   | 5.2.0 | 5.3.0 |
| April 2003     |       |           |     |     | ShDataType.xsd - file attached   | 5.3.0 | 5.3.1 |
| April 2003     |       |           |     |     | Updated ShDataType.xsd - file attached   | 5.3.1 | 5.3.2 |
| June 2003      | CN#20 | NP-030216 | 022 | 1   | Co-ordination of Update of Repository Data   | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 023 | 1   | Enhanced description of Sh-Pull Request and Response   | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 024 | 2   | Enhanced description of Sh-Notif and Sh-Notif-Subs Request and Response                              | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 025 | 2   | A range of editorial changes and corrections and additions of references                             | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 027 | -   | Discrepancy between XML schema of Cx and Sh interface  | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 029 | -   | Correction to the use of User-Identity   | 5.3.2 | 5.4.0 |
| June 2003      | CN#20 | NP-030216 | 030 | -   | Clarification on the handling of the "Charging Information" via the Sh interface                     | 5.3.2 | 5.4.0 |
| Sep 2003       | CN#21 | NP-030384 | 032 | 2   | Correction of message flow   | 5.4.0 | 5.5.0 |
| Sep 2003       | CN#21 | NP-030384 | 033 | 2   | Correction of Sh data definition in Annex C and D  | 5.4.0 | 5.5.0 |
| Sep 2003       | CN#21 | NP-030384 | 035 | 2   | Mistakes in the XML schema   | 5.4.0 | 5.5.0 |
| Dec 2003       | CN#22 | NP-030501 | 038 | -   | XML Schema Correction  | 5.5.0 | 5.6.0 |
| Dec 2003       | CN#22 | NP-030501 | 041 | -   | The extensibility of the XML schema  | 5.5.0 | 5.6.0 |
| Dec 2003       | CN#22 | NP-030518 | 042 | -   | Clarification of inclusion of elements in Charging Information                                       | 5.5.0 | 5.6.0 |
| Dec 2003       | CN#22 |           |     |     | Reference [8] updated  | 5.5.0 | 5.6.0 |
| Mar 2004       | CN#23 | NP-040135 | 044 | 3   | Clarification of which Public Identities are downloaded  | 5.6.0 | 5.7.0 |
| Dec 2004       | CN#26 | NP-040578 | 109 | 2   | Handling of Information Element marked as (M), (C) or (O)  | 5.7.0 | 5.8.0 |
| Dec 2004       | CN#26 | NP-040578 | 110 | -   | Access Key for Charging Information  | 5.7.0 | 5.8.0 |
| Mar 2005       | CN#27 | NP-040531 | 098 | 3   | Sh-Update needs to include Data-Reference to be future proof   | 5.8.0 | 5.9.0 |
| Mar 2005       | CN#27 | NP-040531 | 112 | -   | Align UML Model and the XML schema for Public Identity   | 5.8.0 | 5.9.0 |
| Mar 2005       | CN#27 | NP-040531 | 115 | 1   | Conditional Service indication in Sh-Subs-Notif  | 5.8.0 | 5.9.0 |
| Mar 2005       | CN#27 | NP-040531 | 117 | -   | Sh Diameter AVP Mapping Correction   | 5.8.0 | 5.9.0 |

|          |       |           |     |   |                                 |       |       |
|----------|-------|-----------|-----|---|---------------------------------|-------|-------|
| Mar 2005 | CN#27 | NP-040531 | 120 | 2 | Clarification of Sh Access Keys | 5.8.0 | 5.9.0 |
|----------|-------|-----------|-----|---|---------------------------------|-------|-------|

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## History

| <b>Document history</b> |                |             |
|-------------------------|----------------|-------------|
| V5.0.0                  | June 2002      | Publication |
| V5.1.0                  | September 2002 | Publication |
| V5.2.1                  | December 2002  | Publication |
| V5.3.2                  | April 2003     | Publication |
| V5.4.0                  | June 2003      | Publication |
| V5.5.0                  | September 2003 | Publication |
| V5.6.0                  | December 2003  | Publication |
| V5.7.0                  | March 2004     | Publication |
| V5.8.0                  | December 2004  | Publication |
| V5.9.0                  | March 2005     | Publication |