

# Subscriber Data Management

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## SH/DH Interface Description

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## Publication History

| Revision | Date           | Reason   |
|----------|----------------|--|
| A        | September 2013 | Initial Release. Same as 910-6719-001_rev_a. Date and copyright updated. |
| B        | September 2013 | Added new copyright.   |

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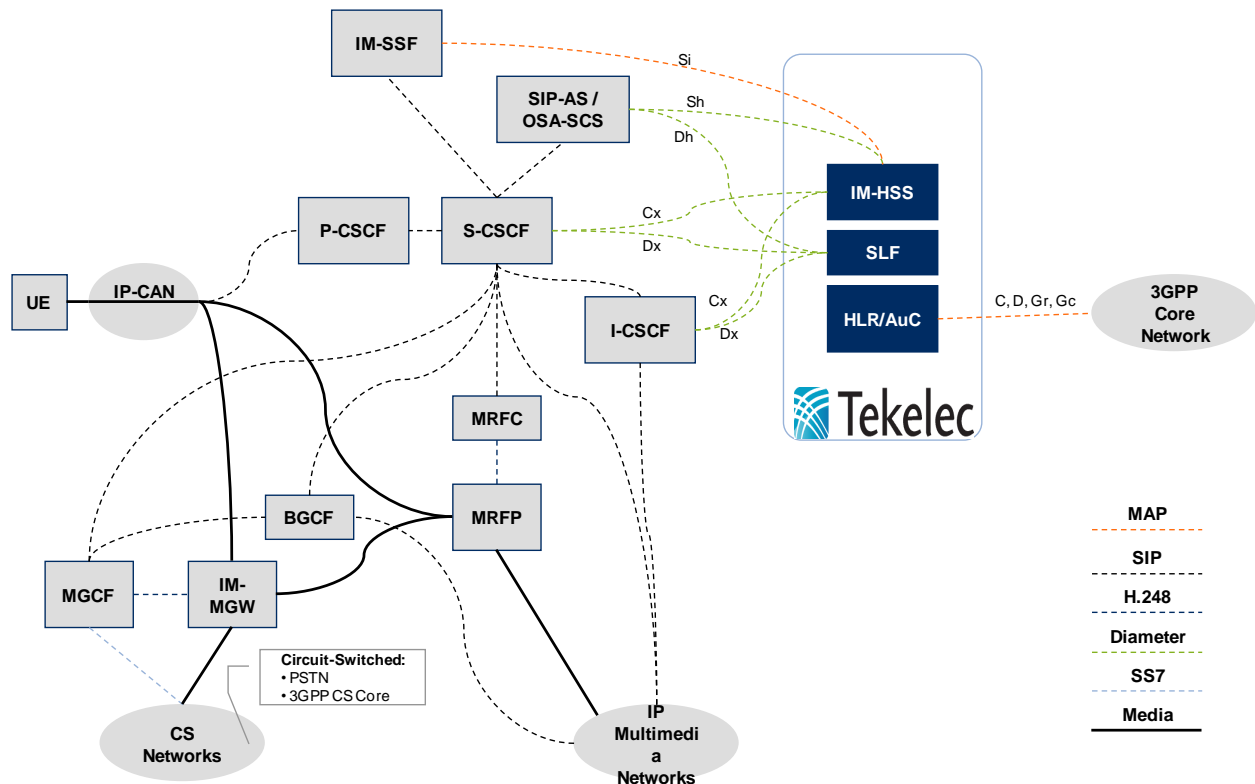
# 1. Introduction

## 1.1 General

This document aims to provide a description of the SDM Diameter-based Sh and Dh interfaces. The Sh interface is a basic functionality of the Tekelec HSS component of the Tekelec platform, while the Dh interface is part of the optional Subscription Locator Function package. The full set of functionality described in this document is available in Tekelec Release 4.0 onwards.

The document details technical compliance of the interface and provides example call flows of key messages exchanged between the SDM HSS/SLF and the external IMS Diameter peers.

## 1.2 Architecture



## 1.3 HSS and SLF implications

The Tekelec HSS implementation is scalable and distributed and therefore does not require the presence of SLF nodes. In the case where several HSS from different vendors are deployed, the SLF functionality can be added to redirect incoming Sh messages to the right HSS. Both the HSS and SLF are

implemented in the same Software process on the SDM, but appear as different Diameter peers to external nodes. Both the HSS and SLF can co-reside or be activated independently.

## 1.4 Acronyms

| Acronym | Description                                    |
|---------|--|
| AS      | Application Center                             |
| AuC     | Authentication Center                          |
| BGCF    | Breakout Gateway Control Function              |
| EU      | European Union                                 |
| HSS     | Home Subscriber Server                         |
| I-CSCF  | Interrogating-Control Session Control Function |
| IM-HSS  | IP Multimedia - Home Subscriber Service        |
| IM-SSF  | IP Multimedia Service Switching Function       |
| IMS     | IP Multimedia Subsystem                        |
| IP-CAN  | IP Connectivity Access Network                 |
| MAP     | Mobile Application Part                        |
| MGCF    | Media Gateway Control Function                 |
| MRFC    | Multimedia Resource Function Controller        |
| MRFP    | Multimedia Resource Function Processor         |
| ngHLR   | Tekelec Home Location Register                 |
| OSA-SCS | Open Service Access Service Capability Server  |
| P-CSCF  | Proxy Call Session Control Function            |
| PNA     | Push-Notification-Answer                       |
| PNR     | Push-Notification-Request                      |
| PUA     | Profile-Update-Answer                          |
| PNR     | Profile-Update-Request                         |
| PS      | Provisioning Server                            |
| PSTN    | Public Switched Telephone Network              |
| RoHS    | Restriction of Hazardous Subscriber            |
| S-CSCF  | Serving Call Session Control Function          |
| SDM     | Session Data Management                        |
| SDS     | Session Data Subscriber                        |
| SIP     | Session Initiation Protocol                    |
| SLF     | Subscription Locator Function                  |
| SNA     | Subscribe-Notifications-Answer                 |
| SNR     | Subscribe-Notifications-Request                |
| SS7     | Signaling System #7                            |
| UDR     | User-Data-Request                              |
| UDA     | User-Data-Answer                               |
| XML     | Extensible Markup Language                     |

## 2. Supported Sh/Dh Messages

---

### 2.1 List of Sh/Dh Messages received by the HSS/SLF

| Sh message         | Diameter Command-Name           | Abbreviation |
|--------------------|---------------------------------|--------------|
| Sh-Pull            | User-Data-Request               | UDR          |
| Sh-Pull Resp       | User-Data-Answer                | UDA          |
| Sh-Update          | Profile-Update-Request          | PUR          |
| Sh-Update Resp     | Profile-Update-Answer           | PUA          |
| Sh-Subs-Notif      | Subscribe-Notifications-Request | SNR          |
| Sh-Subs-Notif Resp | Subscribe-Notifications-Answer  | SNA          |

### 2.2 List of Sh Messages initiated by the HSS

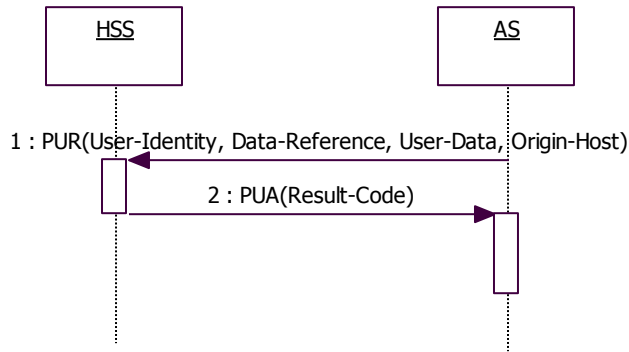
| Sh message    | Diameter Command-Name     | Abbreviation |
|---------------|---------------------------|--------------|
| Sh-Notif      | Push-Notification-Request | PNR          |
| Sh-Notif Resp | Push-Notification-Answer  | PNA          |



### 3. Sh Message Flows

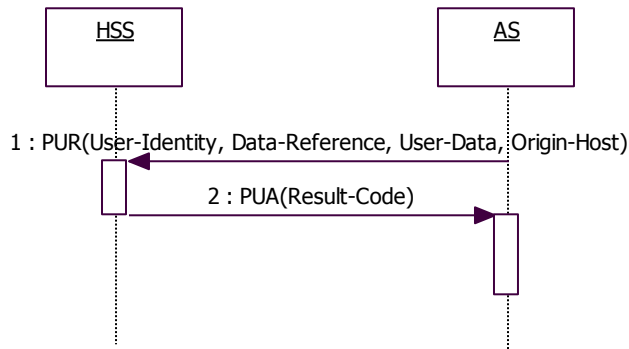
#### 3.1 Subscription to a new service

##### 3.1.1 Subscription to a new service - user not provisioned in HSS



1: Data-Reference = {RepositoryData (0), PSIActivation (18)}  
 2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_UNKNOWN (5001)

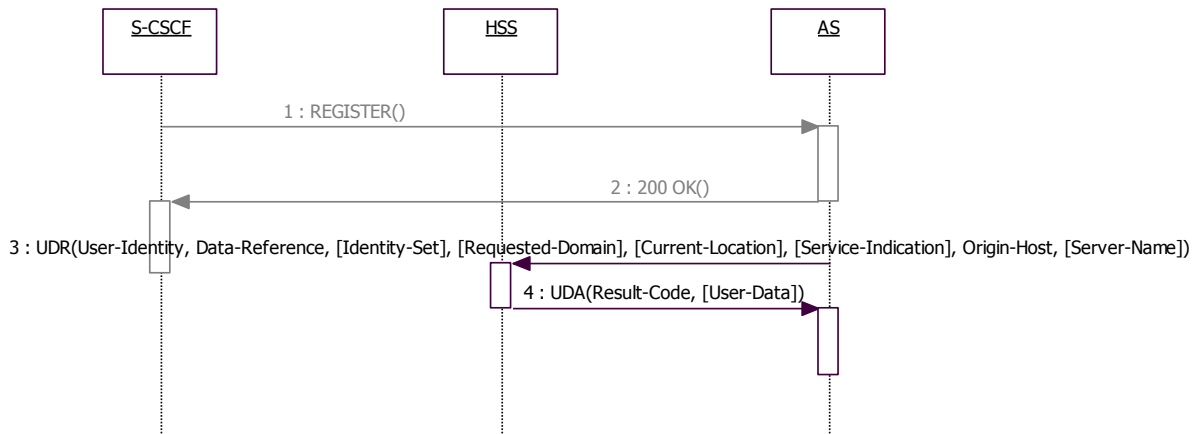
##### 3.1.2 Subscription to a new service - success



1: Data-Reference = {RepositoryData (0), PSIActivation (18)}  
 2: Result-Code = DIAMETER\_SUCCESS (2001)

#### 3.2 Registration - Active location retrieval not requested

##### 3.2.1 Registration – ALR not requested - user not provisioned in HSS



3: Data-Reference = {RepositoryData (0), IMSPublicIdentity (10), IMSUserState (11), S-CSCFName (12), InitialFilterCriteria (13), LocationInformation (14), UserState (15), Charging information (16), MSISDN (17), PSIActivation (18)}

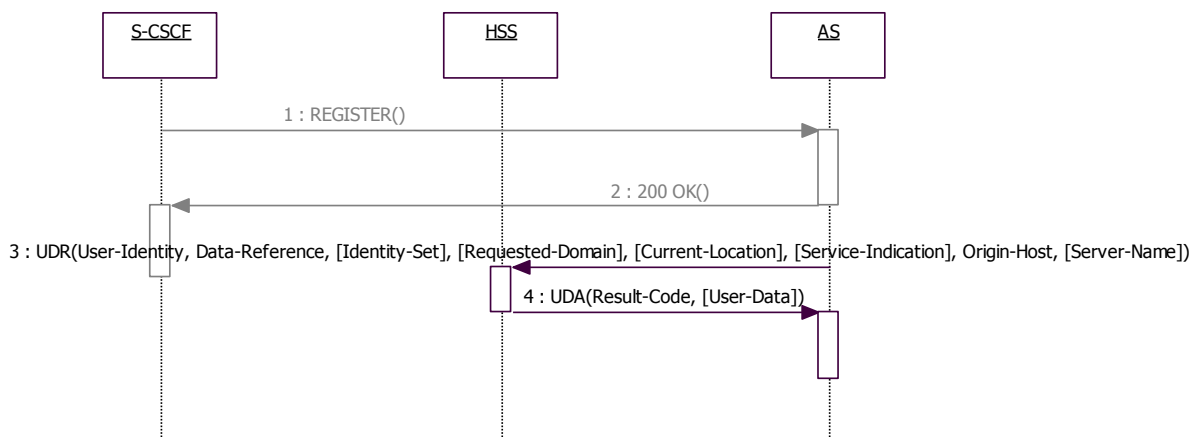
Identity-Set = {ALL\_IDENTITIES (0) (default value if not present), REGISTERED\_IDENTITIES (1), IMPLICIT\_IDENTITIES (2)}

If Data-Reference = {14, 15} then Requested-Domain = {CS-Domain (0), PS-Domain (1)}

If Data-Reference = 14 then Current-Location = DoNotNeedInitiateActiveLocationRetrieval (0)

4: Experimental-Result-Code = {DIAMETER\_ERROR\_USER\_UNKNOW (5001)}

### 3.2.2 Registration – ALR not requested - success



3: Data-Reference = {RepositoryData (0), IMSPublicIdentity (10), IMSUserState (11), S-CSCFName (12), InitialFilterCriteria (13), LocationInformation (14), UserState (15), Charging information (16), MSISDN (17), PSIActivation (18)}

Identity-Set = {ALL\_IDENTITIES (0) (default value if not present), REGISTERED\_IDENTITIES (1), IMPLICIT\_IDENTITIES (2)}

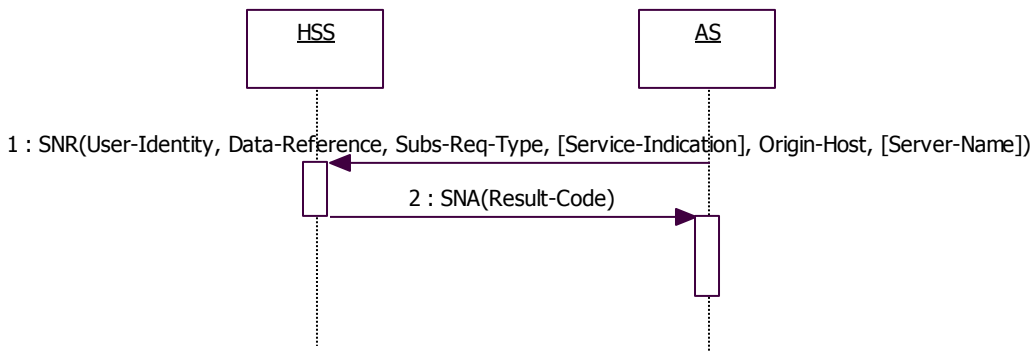
If Data-Reference = {14, 15} then Requested-Domain = {CS-Domain (0), PS-Domain (1)}

If Data-Reference = 14 then Current-Location = DoNotNeedInitiateActiveLocationRetrieval (0)

4: Result-Code = DIAMETER\_SUCCESS (2001)

### 3.3 Subscription to notifications

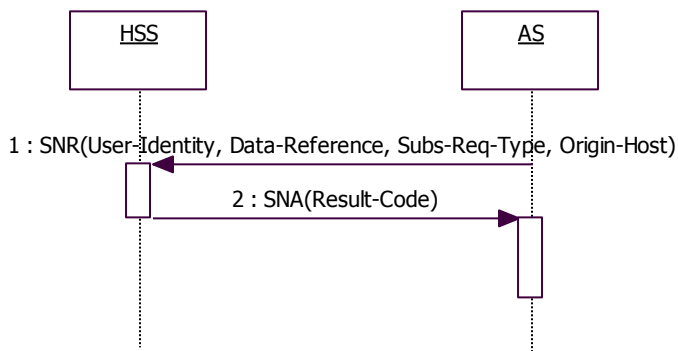
#### 3.3.1 Subscription to notifications – user not provisioned in HSS



1: Data-Reference = {RepositoryData (0), IMSUserState (11), S-CSCFName (12), InitialFilterCriteria (13), PSIActivation (18)}  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_UNKNOWN (5001)

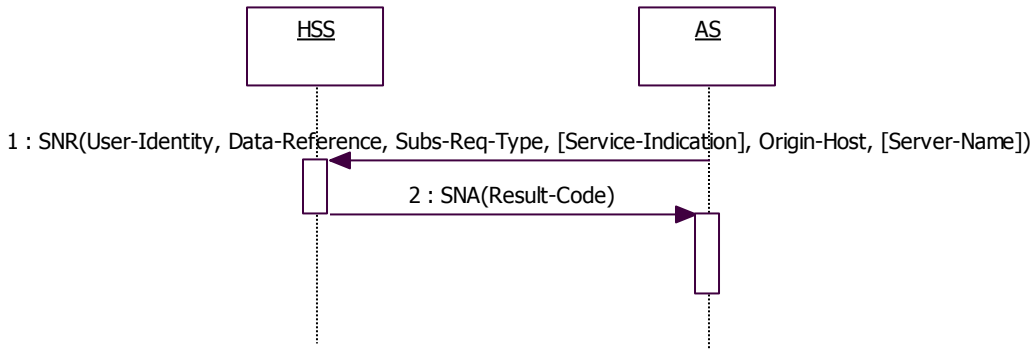
#### 3.3.2 Subscription to notifications – PSI activation for a public identity



1: Data-Reference = PSIActivation (18)  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

2: Experimental-Result-Code = DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED (5101)

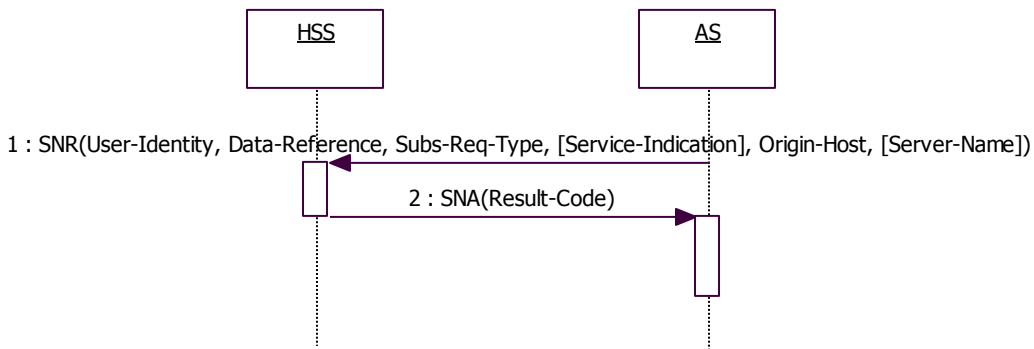
### 3.3.3 Subscription to notifications – AS not in the permission list



1: Data-Reference = {RepositoryData (0), IMSUserState (11), S-CSCFName (12), InitialFilterCriteria (13), PSIActivation (18)}  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_NOTIFIED (5104)

### 3.3.4 Subscription to notifications – success

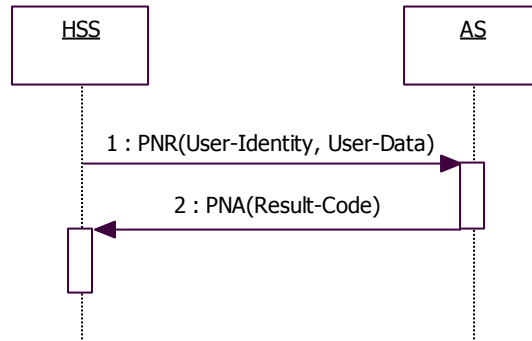


1: Data-Reference = {RepositoryData (0), IMSUserState (11), S-CSCFName (12), InitialFilterCriteria (13), PSIActivation (18)}  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

2: Result-Code = DIAMETER\_SUCCESS (2001)

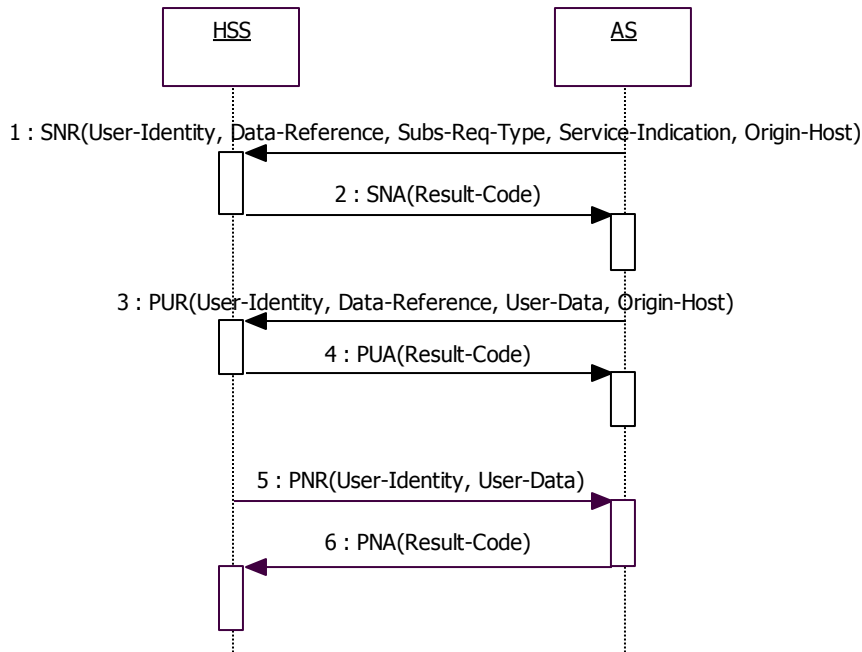
### 3.4 User data update

#### 3.4.1 User data update – user not provisioned in AS



2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_UNKNOWN (5001)

#### 3.4.2 User data update – repository data



1: Data-Reference = RepositoryData (0)  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

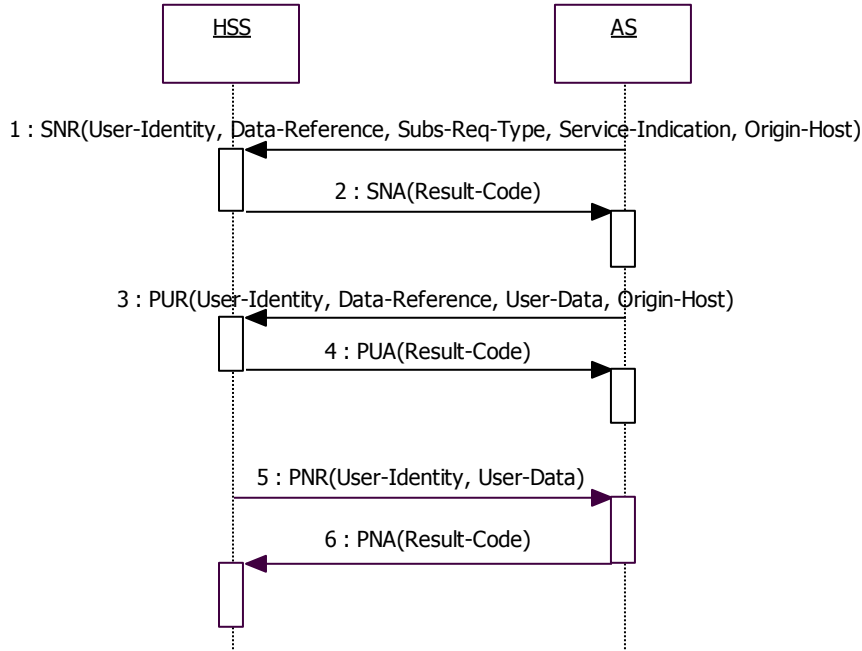
2: Result-Code = DIAMETER\_SUCCESS (2001)

3: Data-Reference = RepositoryData (0)

4: Result-Code = DIAMETER\_SUCCESS (2001)

6: Result-Code = DIAMETER\_SUCCESS (2001)

### 3.4.3 User data update – PSI activation



1: Data-Reference = PSIActivation (18)  
 Subs-Req-Type = {Subscribe (0), Unsubscribe (1)}

2: Result-Code = DIAMETER\_SUCCESS (2001)

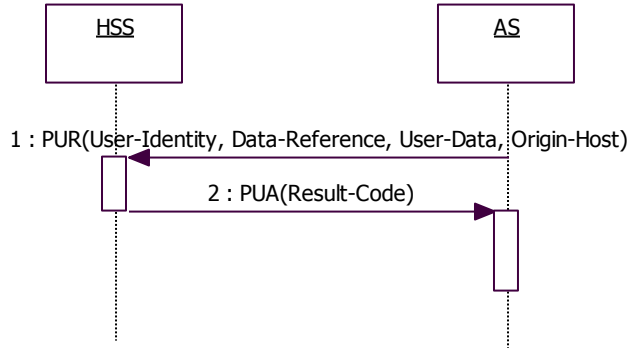
3: Data-Reference = PSIActivation (18)

4: Result-Code = DIAMETER\_SUCCESS (2001)

6: Result-Code = DIAMETER\_SUCCESS (2001)

### 3.5 User service data update

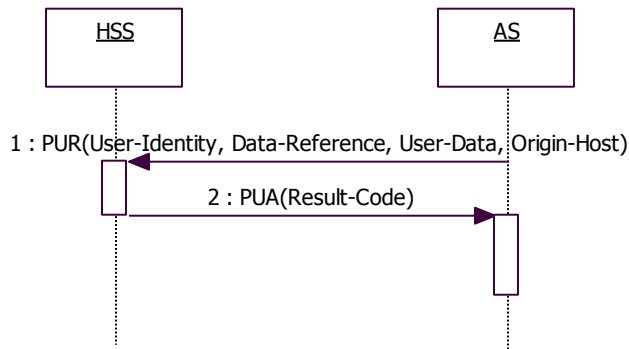
#### 3.5.1 User service data update – user not provisioned in HSS



1: Data-Reference = {RepositoryData (0), PSIActivation (18)}

2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_UNKNOWN (5001)

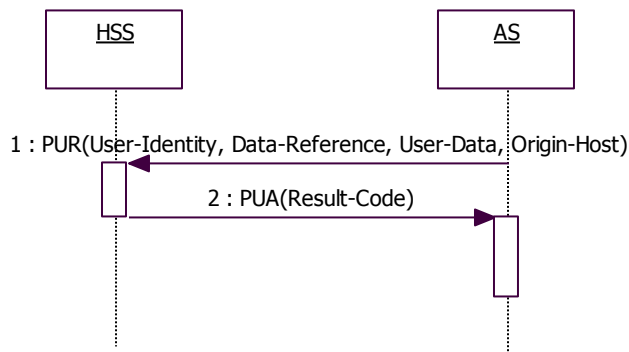
#### 3.5.2 User service data update – PSI activation for a public identity



1: User-Identity is a public identity  
Data-Reference = PSIActivation (18)

2: Experimental-Result-Code = DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED (5101)

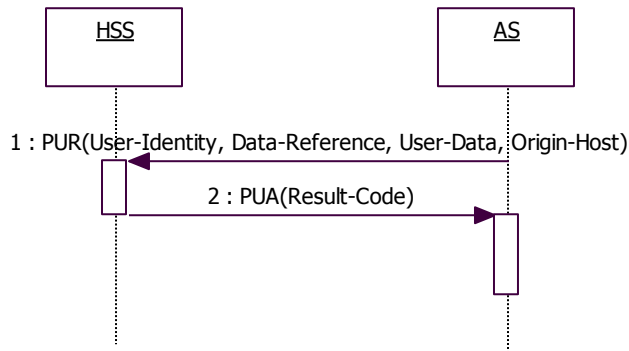
### 3.5.3 User service data update – clearing a non-existing repository



1: Data-Reference = RepositoryData (0)  
 User-Data = {}

2: Experimental-Result-Code = DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED (5101)

### 3.5.4 User service data update – AS not in the permission list

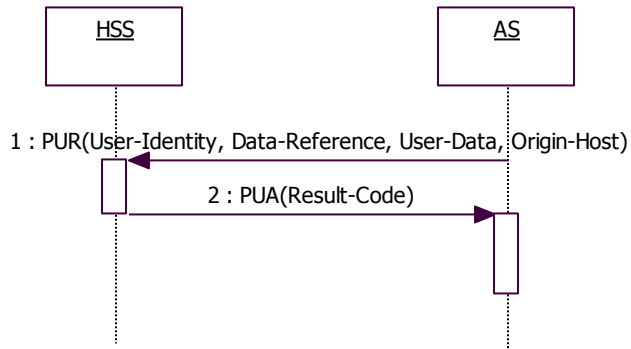


1: Data-Reference = RepositoryData (0)

2: Experimental-Result-Code = DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_MODIFIED (5103)



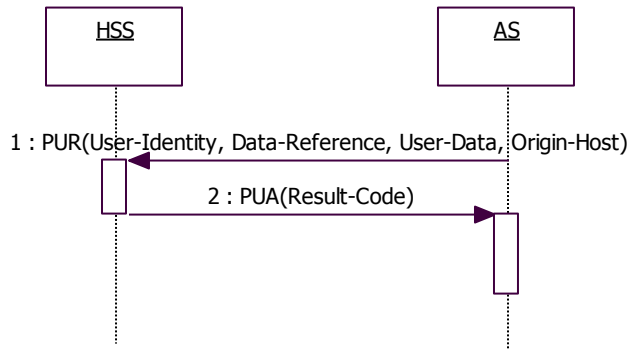
### 3.5.5 User service data update – update out of sync



1: Data-Reference = RepositoryData (0)

2: Experimental-Result-Code = DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC (5105)

### 3.5.6 User data update – trying to store more than 64 KB of user-data



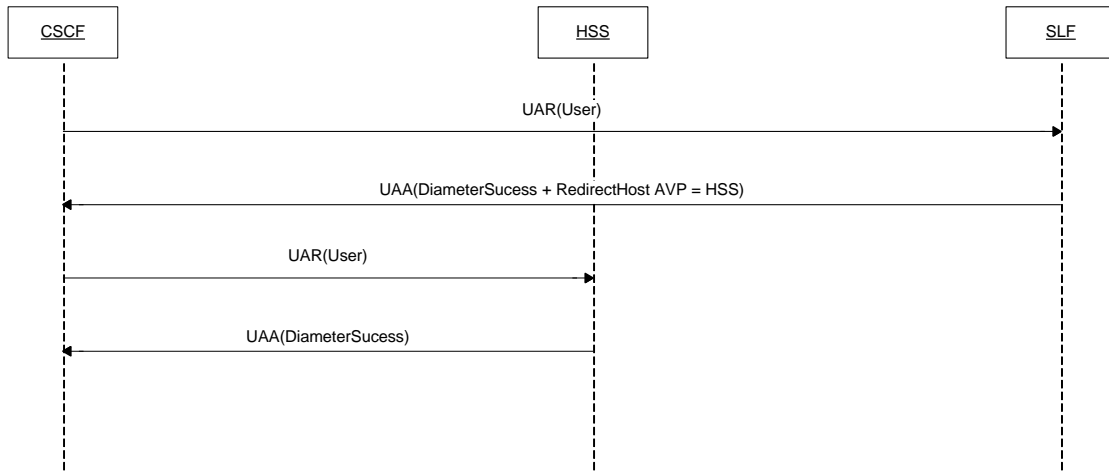
1: Data-Reference = RepositoryData (0)  
User-Data: size is more than 65536 bytes

2: Experimental-Result-Code = DIAMETER\_ERROR\_TOO\_MUCH\_DATA (5008)

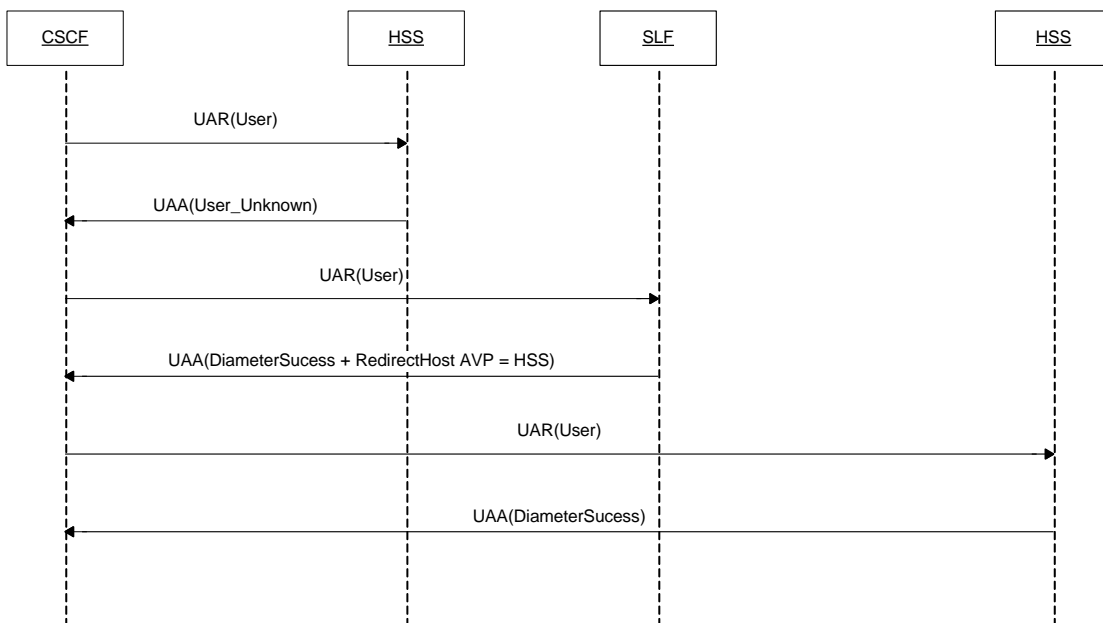
## 4. Dh Message Flows

Examples provided in this section show CSCF Cx messages, but behavior is identical on Sh.

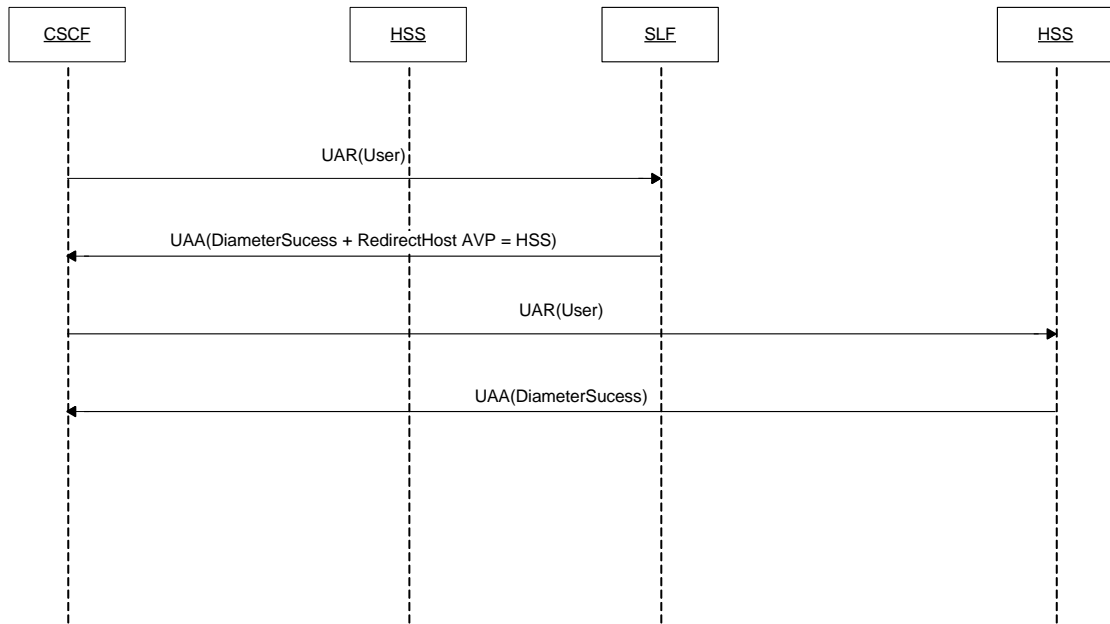
### 4.1 Dh message to SLF, redirected to Tekelec HSS



### 4.2 Sh message to HSS, user unknown



### 4.3 Dh message to SLF, redirected to external HSS



## 5. Sh Message Content

Cat values: M (Mandatory), O (Optional)

### 5.1 UDR (User-Data-Request)

| AVP                | Cat | Supported Values   |
|--------------------|-----|--|
| User-Identity      | M   | IMS public User Identity, Public Service Identity, or MSISDN   |
| Data-Reference     | M   | RepositoryData (0)<br>IMSPublicIdentity (10)<br>IMSUserState (11)<br>S-CSCFName (12)<br>InitialFilterCriteria (13)<br>LocationInformation (14)<br>UserState (15)<br>Charging information (16)<br>MSISDN (17)<br>PSIActivation (18) |
| Identity-Set       | O   | Present if Data-Reference = IMSPublicIdentity (10)<br>ALL_IDENTITIES (0) – Default<br>REGISTERED_IDENTITIES (1)<br>IMPLICIT_IDENTITIES (2)   |
| Requested-Domain   | O   | Present if Data-Reference = {LocationInformation (14),<br>UserState (15)}<br>CS-Domain (0)<br>PS-Domain (1)  |
| Current-Location   | O   | Present if Data-Reference = LocationInformation (14)<br>DoNotNeedInitiateActiveLocationRetrieval (0)<br>InitiateActiveLocationRetrieval (1)  |
| Service-Indication | O   | Present if Data-Reference = RepositoryData (0)   |
| Origin-Host        | M   |  |
| Server-Name        | O   | Present if Data-Reference = InitialFilterCriteria (13)   |

## 5.2 UDA (User-Data-Answer)

| AVP                               | Cat | Supported Values   |
|-----------------------------------|-----|--|
| Result-Code / Experimental-Result | M   | Result-Code = DIAMETER_SUCCESS (2001)<br>DIAMETER_UNABLE_TO_COMPLY (5012)<br>Experimental-Result-Code =<br>DIAMETER_ERROR_USER_UNKNOWN (5001)<br>DIAMETER_ERROR_OPERATION_NOT_ALLOWED (5101)<br>DIAMETER_ERROR_USER-DATA_CANNOT_BE_READ (5102)<br>DIAMETER_USER_DATA_NOT_AVAILABLE (4100)<br>DIAMETER_REDIRECT_INDICATION (3006) |
| User-Data                         | O   |  |

## 5.3 PUR (Profile-Update-Request)

| AVP            | Cat | Supported Values                                    |
|----------------|-----|---|
| User-Identity  | M   | IMS public User Identity or Public Service Identity |
| Data-Reference | M   | RepositoryData (0)<br>PSIActivation (18)            |
| User-Data      | M   |   |
| Origin-Host    | M   |   |

## 5.4 PUA (Profile-Update -Answer)

| AVP                               | Cat | Supported Values   |
|-----------------------------------|-----|--|
| Result-Code / Experimental-Result | M   | Result-Code = DIAMETER_SUCCESS (2001)<br>DIAMETER_UNABLE_TO_COMPLY (5012)<br>Experimental-Result-Code =<br>DIAMETER_ERROR_USER_UNKNOWN (5001)<br>DIAMETER_ERROR_USER_DATA_NOT_RECOGNIZED (5100)<br>DIAMETER_ERROR_OPERATION_NOT_ALLOWED (5101)<br>DIAMETER_ERROR_USER_DATA_CANNOT_BE_MODIFIED (5103)<br>DIAMETER_ERROR_TOO_MUCH_DATA (5008)<br>DIAMETER_ERROR_TRANSPARENT_DATA_OUT_OF_SYNC (5105)<br>DIAMETER_PRIOR_UPDATE_IN_PROGRESS (4101)<br>DIAMETER_REDIRECT_INDICATION (3006) |

### 5.5 SNR (Subscribe-Notifications-Request)

| AVP                | Cat | Supported Values   |
|--------------------|-----|--|
| User-Identity      | M   | IMS public User Identity or Public Service Identity  |
| Data-Reference     | M   | RepositoryData (0)<br>IMSUserState (11)<br>S-CSCFName (12)<br>InitialFilterCriteria (13)<br>PSIActivation (18) |
| Subs-Req-Type      | M   | Subscribe (0)<br>Unsubscribe (1)   |
| Service-Indication | O   | Present if Data-Reference = RepositoryData (0)   |
| Origin-Host        | M   |  |
| Server-Name        | O   | Present if Data-Reference = InitialFilterCriteria (13)   |

### 5.6 SNA (Subscribe-Notifications-Answer)

| AVP                               | Cat | Supported Values  |
|-----------------------------------|-----|---|
| Result-Code / Experimental-Result | M   | Result-Code = DIAMETER_SUCCESS (2001)<br>DIAMETER_UNABLE_TO_COMPLY (5012)<br>Experimental-Result-Code =<br>DIAMETER_ERROR_USER_UNKNOWN (5001)<br>DIAMETER_ERROR_OPERATION_NOT_ALLOWED (5101)<br>DIAMETER_ERROR_USER_DATA_CANNOT_BE_NOTIFIED (5104)<br>DIAMETER_REDIRECT_INDICATION (3006) |

### 5.7 PNR (Push-Notification-Request)

| AVP           | Cat | Supported Values                                    |
|---------------|-----|---|
| User-Identity | M   | IMS public User Identity or Public Service Identity |
| User-Data     | M   |   |

## 5.8 PNA (Push-Notification-Answer)

| AVP                               | Cat | Supported Values   |
|-----------------------------------|-----|--|
| Result-Code / Experimental-Result | M   | Result-Code = DIAMETER_SUCCESS (2001)<br>DIAMETER_UNABLE_TO_COMPLY (5012)<br>Experimental-Result-Code =<br>DIAMETER_ERROR_USER_UNKNOWN (5001)<br>DIAMETER_ERROR_USER_DATA_NOT_RECOGNIZED (5100)<br>DIAMETER_ERROR_OPERATION_NOT_ALLOWED (5101)<br>DIAMETER_ERROR_USER_DATA_CANNOT_BE_MODIFIED (5103)<br>DIAMETER_ERROR_TOO_MUCH_DATA (5008)<br>DIAMETER_PRIOR_UPDATE_IN_PROGRESS (4101)<br>DIAMETER_REDIRECT_INDICATION (3006) |

## 5.9 User-Data

| XML tag               | Supported Values   |
|-----------------------|--|
| RepositoryData        |  |
| IMSPublicIdentity     | IMS public User Identity or Public Service Identity  |
| IMSUserState          | REGISTERED,<br>NOT_REGISTERED,<br>AUTHENTICATION_PENDING,<br>REGISTERED_UNREG_SERVICES   |
| S-CSCFName            |  |
| InitialFilterCriteria |  |
| LocationInformation   | See section 4.10   |
| UserState             | Busy,<br>Not reachable,<br>Idle  |
| Charging information  | PrimaryEventChargingFunctionName<br>SecondaryEventChargingFunctionName<br>PrimaryChargingCollectionFunctionName<br>SecondaryChargingCollectionFunctionName |
| MSISDN                |  |
| PSIActivation         | ACTIVE,<br>INACTIVE  |

## 5.10 Location Information

| Information element name    | Cat | Description  |
|-----------------------------|-----|--|
| Location number             | O   | Present if the VLR can derive it from the stored service area identity (for UMTS) or cell global identity (for GSM) or location area identity. |
| Service area ID             | O   | Present if the MS uses UMTS radio access and the subscriber record is marked as confirmed by radio contact.                                    |
| Cell Global ID              | O   | Present if the MS uses GSM radio access and the subscriber record is marked as confirmed by radio contact.                                     |
| Geographical information    | O   | Present if the VLR can derive it from the stored service area identity, cell global identity or location area identity.                        |
| Geodetic information        | O   | Present if the VLR can derive it from the stored service area identity, cell global identity or location area identity.                        |
| VLR or MSC or SGSN number   | O   |  |
| Age of location information | O   | Present if available in the MSC/VLR.   |
| Current Location Retrieved  | O   | Present when location information was obtained after a successful paging procedure for Active Location Retrieval.                              |



## 6. Dh Message Content

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The Dh interface message content is the same as the Sh message content described in Section 8, with the addition of the RedirectHost AVP in the UDA, PUA, SNA messages.



## **Subscriber Data Management**

**SH/DH Interface Description**

**910-6856-001**

**Revision B**