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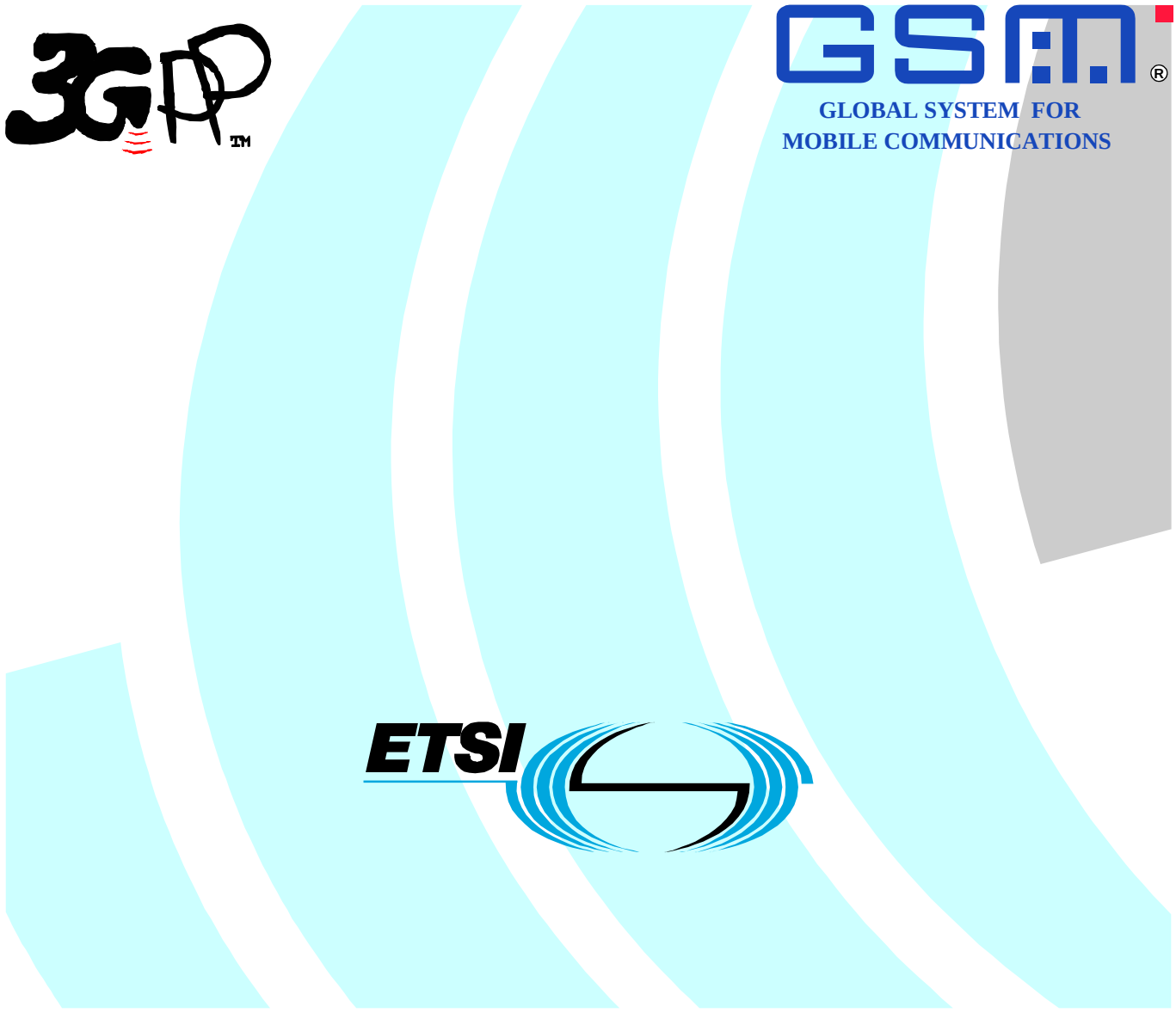
Technical Specification

**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 5.3.2 Release 5)**



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Contents

Foreword

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

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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.

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] draft-ietf-aaa-diameter-17, “Diameter Base Protocol”, work in progress

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

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.

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.

6 Procedure Descriptions

6.1 User data handling procedures

6.1.1 Data read (Sh-Pull)

This procedure is used by an AS to read transparent and/or non-transparent data from the HSS. Tables 6.1.1.1 and 6.1.1.2 detail the involved information elements.

This procedure is mapped to the commands User-Data-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5].

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 list of references 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.
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 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	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).

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.

6.1.1.1 Detailed behaviour

Upon reception of the Sh-Pull request, the HSS may check that the user for whom data is asked exists in HSS. The HSS shall 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).

The HSS shall return the requested data identified by User-Identity and Data-Reference. Check table 7.6.1 to see when Requested-Domain must be present in the request as an additional key to the requested data. If repository data are 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 of initial filter criteria are limited to those initial filter criteria which are relevant to the requesting AS.

6.1.2 Data Update (Sh-Update)

This procedure is used by an AS to update data in the HSS. Tables 6.1.2.1 and 6.1.2.2 detail the involved information elements.

This procedure is mapped to the commands Profile-Update-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5].

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.

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.

6.1.2.1 Detailed behaviour

Upon reception of the Sh-Update request, the HSS may check that the user for whom data is asked to be updated exists in the HSS. The HSS shall 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).

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 is also sent as part of the information element Data. The HSS shall check whether repository data identified by the Service-Indication is already stored for the user and whether Service-Data is received.

- If so, the stored data is replaced with the received data.
- If repository data identified by the Service-Indication is stored for the user and Service-Data is not received, the stored data is removed from the repository.
- If repository data identified by the Service-Indication is not stored for the user and Service-Data is received, the received data is added to the repository.
- If repository data identified by the Service-Indication is not stored for the user and Service-Data is not received, the repository data is not updated.

If the HSS receives more user data than it is prepared to accept, it shall return Experimental-Result-Code AVP to DIAMETER_ERROR_TOO_MUCH_DATA and discard the data received from the AS.

6.1.3 Subscription to notifications (Sh-Subs-Notif)

This procedure is used by an AS to subscribe to notifications from the HSS of changes in data. Tables 6.1.3.1 and 6.1.3.2 detail the involved information elements.

This procedure is mapped to the commands Subscribe-Notifications-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5].

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 list of references 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	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).

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.
Requested data (See 7.3)	Data-Reference	C	This information element includes the list of references to data for which subscription to notifications of change is rejected by the HSS.

6.1.3.1 Detailed behaviour

Upon reception of the Sh-Subs-Notif request, the HSS may check that the user for whom notifications are asked exists in HSS. The HSS shall 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).

The HSS shall take note of the subscription request on the data identified by 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.

If there were values of Data-Reference for which the AS is not allowed to subscribe to notifications of change, the HSS shall include the list of values in the Sh-Subs-Notif Resp.

6.1.4 Notifications (Sh-Notif)

This procedure is used by the HSS to send to an AS notifications of changes in data to which the AS has previously subscribed using Sh-Subs-Notif. Tables 6.1.4.1 and 6.1.4.2 detail the involved information elements.

This procedure is mapped to the commands Push-Notification-Request/Answer in the Diameter application specified in 3GPP TS 29.329 [5].

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.
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 (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.

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 public identity (either SIP-URL, TEL-URL or MSISDN).

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 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 reference values, access key and recommended access rights for the data accessible via the Sh interface. 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	May be included in the operations:
0	RepositoryData	7.6.1	Public-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 + Server-Name	Sh-Pull, Sh-Subs-Notif
14	LocationInformation	7.6.6	User-Identity + Data-Reference+ Requested-Domain	Sh-Pull
15	UserState	7.6.7		
16	Charging information	7.6.8		Sh-Pull, Sh-Update

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 PublicIdentifiers

List of public identities of the user.

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 and 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 IE 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.

7.6.6.1 Location information for CS

It consists of the following subordinate information elements:

- Location number: defined in ITU-T Recommendation Q.763. Considerations described in 3GPP TS 23.018 apply.
- Service area ID: defined in 3GPP TS 23.003.
- Global Cell ID: defined in 3GPP TS 23.003.
- Location area ID: defined in 3GPP TS 23.003
- Geographical Information: defined in 3GPP TS 23.032. Considerations described in 3GPP TS 23.018 and 3GPP TS 29.002 apply.
- Geodetic Information: defined in ITU-T Recommendation Q.763. Considerations described in 3GPP TS 23.018 and 3GPP TS 29.002 apply.
- VLR Number: defined in 3GPP TS 23.003.
- MSC Number: defined in 3GPP TS 23.003.
- Age of location information: defined in 3GPP TS 23.018.
- 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

It consists of the following subordinate information elements:

- Service area ID: defined in 3GPP TS 23.003.
- Global Cell ID: defined in 3GPP TS 23.003.
- Location area ID: defined in 3GPP TS 23.003

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

For both information elements, Location Information for CS and Location Information for GPRS, the considerations described in 3GPP TS 23.078 apply.

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 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

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 the 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.

7.7 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.

8 Protocol version identification

See 3GPP TS 29.329 [5].

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

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

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.

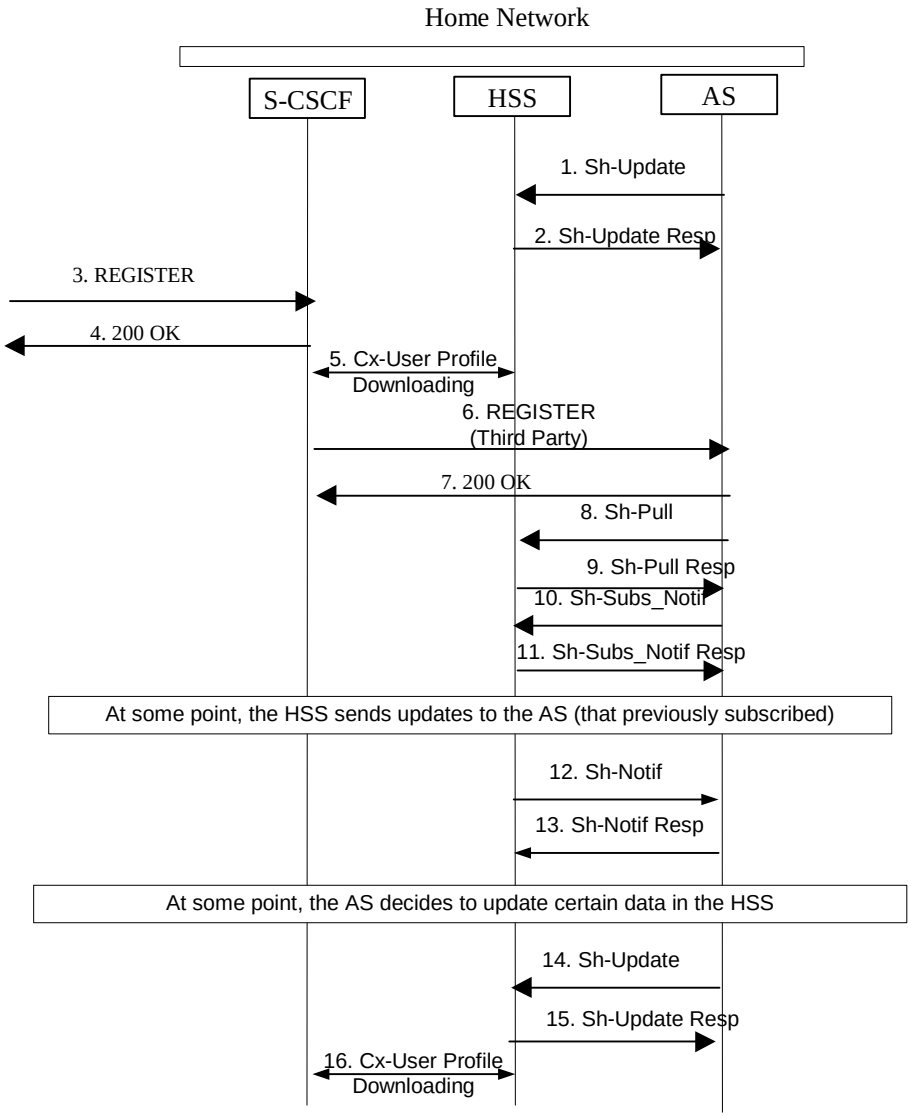

Figure B.1.1: Data Update, Registration, Notification Subscription

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. filter criteria, repository data.

2. HSS confirms the data is updated

3. Some time later, user registers with the network
4. 200 OK
5. S-CSCF downloads the data from the HSS. Filter criteria specify that the AS wants to be notified that the end user is registered.
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. filter criteria in the HSS, by means of Cx-Update (user identity, updated data).
15. The HSS confirms the service data is updated.
16. If the updated data is needed in the S-CSCF, e.g. filter criteria, the HSS updates the data in the S-CSCF.

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:

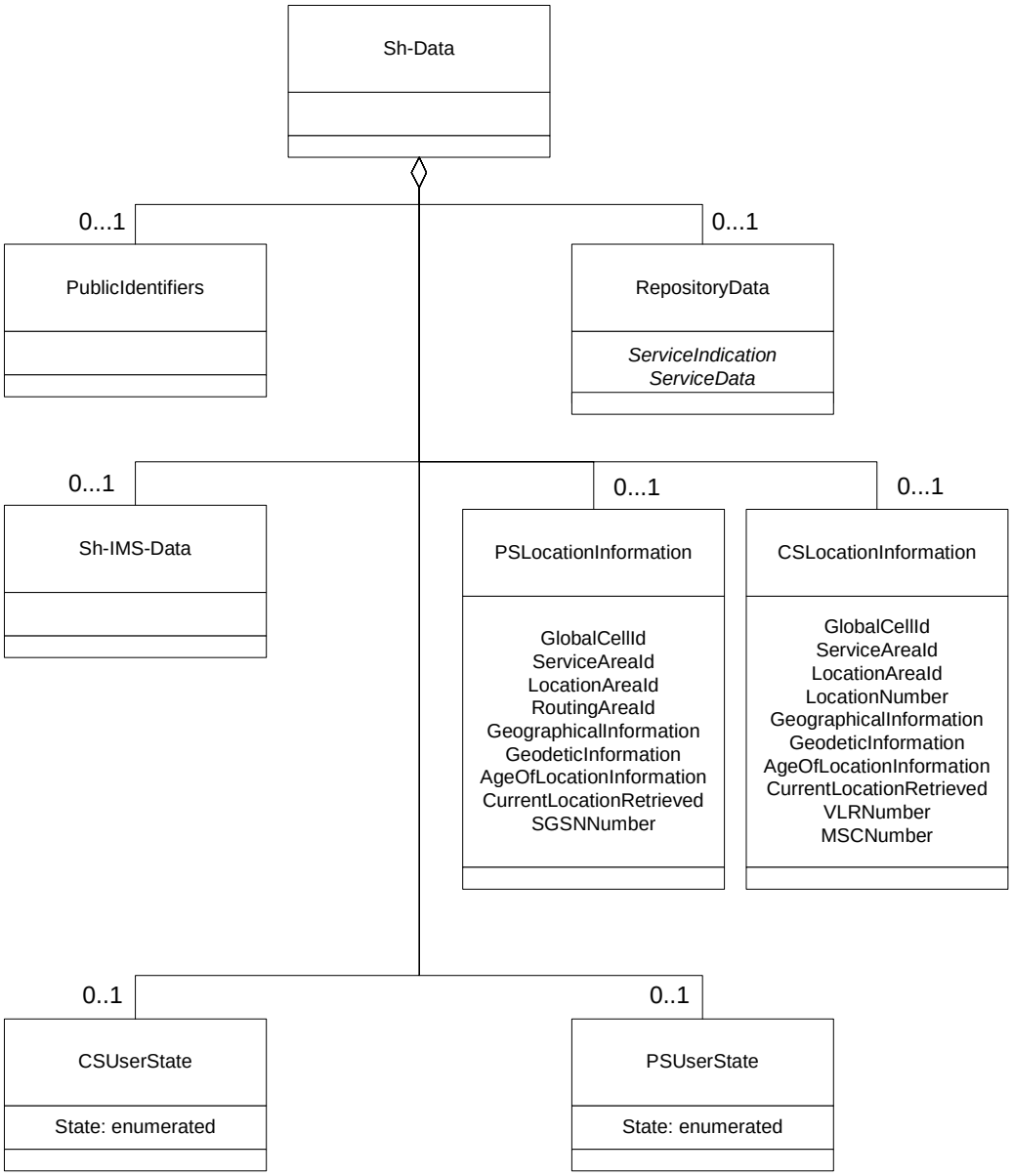

Figure C.1.1: Sh-Data

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 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:

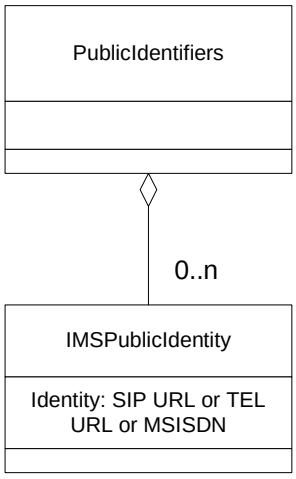

Figure C.2.1: The UML model of the class PublicIdentifiers

Class PublicIdentifiers contains 0 to n user public identities. 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.

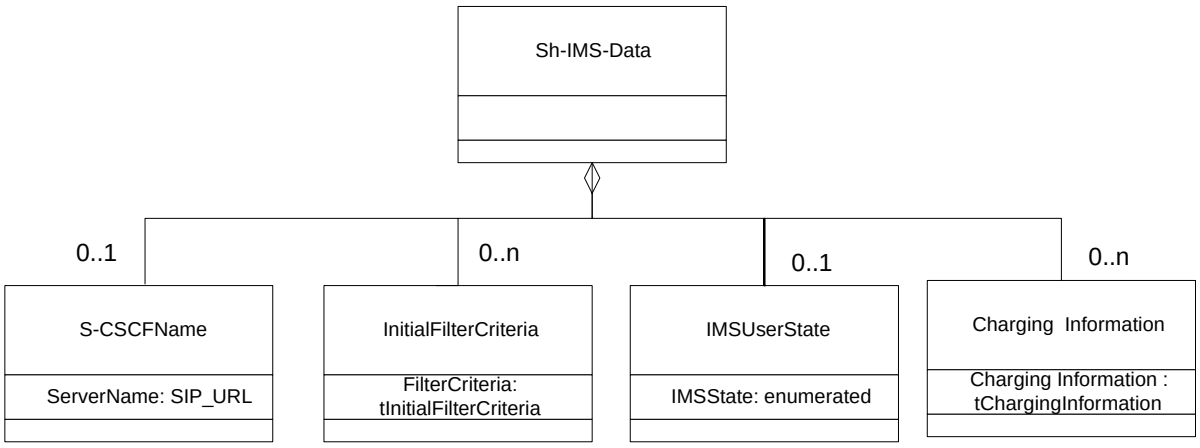

Figure C.3.1: Sh-IMS-Data

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 and/or 0 or 1 instance or the IMSUserState class.

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: 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). Lenght >=4 and <=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	>=0, <=32767
tAddressString	AddressString	string	Syntax described in 3GPP TS 29.002 (base 64 encoded according to RFC 2045). Length >= 4 and <=28 (multiples of 4).
tMSISDN	MSISDN	string	Syntax described in 3GPP TS 23.003.
tSIP_URL	PublicIdentity	anyURI	Syntax described in RFC 3261
tTEL_URL	PublicIdentity	anyURI	Syntax described in RFC 2806
tDiameterURI	DiameterURI	string	Syntax of a Diameter URI as described in [8]
tIMSPublicIdentity	IMSPublicIdentity	(union)	Union of tSIP_URL and tTEL_URL
tServiceInfo	ServiceInfo	string	
tString	RequestURI, Method, Header, Content, Line	string	
tBool	ConditionTypeCNF,	boolean	Possible values:

	ConditionNegated		0 (false) 1 (true)

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	1
		ServiceData	string	0 to 1
tShIMSData	Sh-IMS-Data	SCSCFName	tSIP_URL	0 to n
		InitialFilterCriteria	tInitialFilterCriteria	0 to 10
		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	Trigger	SPT		tSePoTri	0 to n
		ConditionTypeCNF		tBool	1
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	1
		SecondaryEventChargingFunctionName		tDiameterURI	1
		PrimaryChargingCollectionFunctionName		tDiameterURI	1
		SecondaryChargingCollectionFunctionName		tDiameterURI	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

History

Document history		
V5.0.0	June 2002	Publication
V5.1.0	September 2002	Publication
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