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All-IP Core Network Multimedia Domain

Sh Interface Based on Diameter Protocols Protocol Details – Stage 3

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Protocol Details – Stage 3

Contents

Foreword

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Revision History

Revision	Changes	Date
0, v1.0	Initial Publication	December 2003
0, v2.0	Version Update	July 2005

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1 Scope

The present document defines a transport protocol for use in the IP multimedia (IM) Core Network (CN) subsystem based on Diameter.

The present document is applicable to:

- The Sh interface between an SIP AS and the AAA.
- The Sh interface between an SCS and the AAA.

Whenever it is possible this document specifies the requirements for this protocol by reference to specifications produced by the IETF within the scope of Diameter. Where this is not possible, extensions to Diameter are defined within this document.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP2 document, a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP2 X.S0013-010-0 v2.0: "IP Multimedia (IM) Subsystem Sh interface; signalling flows and message contents".

[2] void

[3] IETF RFC 2960 "Stream Control Transmission Protocol"

[4] IETF RFC 3588, "Diameter Base Protocol", September 2003.

[5] IETF RFC 2234 "Augmented BNF for syntax specifications"

[6] 3GPP2 X.S0013-006-0 v2.0: "Cx Interface based on Diameter protocol; protocol details".

[7] IETF RFC 3589, "Diameter Command Codes for 3GPP Release 5", September 2003.

[8] 3GPP TS 23.003 V5.6.0 (2003-06): 3GPP Technical Specification Group Core Network; Numbering, addressing and identification (Release 5)

3 Definitions, symbols and abbreviations

3.1 Definitions

Refer to [4] for the definitions of some terms used in this document.

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

Attribute-Value Pair: see [4], it corresponds to an Information Element in a Diameter message.

Server: SIP-server.

User data: user profile data.

3.2 Abbreviations

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

AAA	Authentication, Authorization and Accounting
AS	Application Server
ABNF	Augmented Backus-Naur Form
AVP	Attribute-Value Pair
CN	Core Network
HSS	Home Subscriber Server
IANA	Internet Assigned Numbers Authority
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
RFC	Request For Comment
SCS	Service Capability Server
SCTP	Stream Control Transport Protocol
UCS	Universal Character Set
URL	Uniform Resource Locator
UTF	UCS Transformation Formats

4 General

The Diameter Base Protocol as specified in [4] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and event codes specified in clause 65 of this specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) are unmodified.

Note: The MSISDN represented in this document is similar to the MDN in 3GPP2.

5 Use of the Diameter base protocol

The same clarifications of section 5 of [6] shall apply to the Sh interface. An exception is that the application identifier for this application is defined in chapter 6.

6 Diameter application for Sh interface

This clause specifies a Diameter application that allows a Diameter server and a Diameter client:

- to download and update transparent and non-transparent user data
- to request and send notifications on changes on user data

The Sh interface protocol is defined as an IETF vendor specific Diameter application, where the vendor is 3GPP. The vendor identifier assigned by IANA to 3GPP (http://www.iana.org/assignments/enterprise-numbers) is 10415.

The Diameter application identifier assigned to the Sh interface application is ~~16777215~~16777217~~-~~.

6.1 Command-Code values

This section defines Command-Code values for this Diameter application.

Every command is defined by means of the ABNF syntax [5], according to the rules in [4]. Whenever the definition and use of an AVP is not specified in this document, what is stated in [4] or [6] shall apply.

The command codes for the Sh interface application are taken from the range allocated by IANA in [7] as assigned in this specification. For these commands, the Application-ID field shall be set to ~~16777215~~16777217 (application identifier of the Sh interface application).

The following Command Codes are defined in this specification:

Table 6.1.1: Command-Code values

Command-Name	Abbreviation	Code	Section
User-Data-Request	UDR	306	6.1.1
User-Data-Answer	UDA	306	6.1.2
Profile-Update-Request	PUR	307	6.1.3
Profile-Update-Answer	PUA	307	6.1.4
Subscribe-Notifications-Request	SNR	308	6.1.5
Subscribe-Notifications-Answer	SNA	308	6.1.6
Push-Notification-Request	PNR	309	6.1.7
Push-Notification-Answer	PNA	309	6.1.8

6.1.1 User-Data-Request (UDR) Command

The User-Data-Request (UDR) command, indicated by the Command-Code field set to 306 and the 'R' bit set in the Command Flags field, is sent by a Diameter client to a Diameter server in order to request user data.

Message Format

< User-Data -Request> ::= < Diameter Header:306, ~~16777215~~16777217, ~~-~~REQ, PXY, 16777217 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[Destination-Host]
{ Destination-Realm }
{ User-Identity }
[Service-Indication]
[Server-Name]
1*{ Data-Reference }
[Identity-Set]
*[Requested-Domain]
[Current-Location]
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.2 User-Data-Answer (UDA) Command

The User-Data-Answer (UDA) command, indicated by the Command-Code field set to 306 and the 'R' bit cleared in the Command Flags field, is sent by a server in response to the User-Data-Request command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section 6.2 in addition to the values defined in [6].

Message Format

< User-Data-Answer > ::= < Diameter Header: 306, PXY, 16777217~~TDB~~ >
< Session-Id >
{ Vendor-Specific-Application-Id }

[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[User-Data]
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.3 Profile-Update-Request (PUR) Command

The Profile-Update-Request (PUR) command, indicated by the Command-Code field set to 307 and the 'R' bit set in the Command Flags field, is sent by a Diameter client to a Diameter server in order to update user data in the server.

Message Format

< Profile-Update-Request > ::= < Diameter Header: 307, ~~16777215~~16777217, ~~,~~ REQ, PXY, 16777217 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{ Destination-Host }
{ Destination-Realm }
{ User-Identity }
{ Data-Reference }
{ User-Data }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.4 Profile-Update-Answer (PUA) Command

The Profile-Update-Answer (PUA) command, indicated by the Command-Code field set to 307 and the 'R' bit cleared in the Command Flags field, is sent by a client in response to the Profile-Update-Request command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section 6.2 in addition to the values defined in [6].

Message Format

< Profile-Update-Answer > ::= < Diameter Header: 307, PXY, ~~16777215~~16777217>
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.5 Subscribe-Notifications-Request (SNR) Command

The Subscribe-Notifications-Request (SNR) command, indicated by the Command-Code field set to 308 and the 'R' bit set in the Command Flags field, is sent by a Diameter client to a Diameter server in order to request notifications of changes in user data.

Message Format

< Subscribe-Notifications-Request > ::= PXY, 16777217 >	< Diameter Header: 308, ~~167772152~~16777217, ~~-~~REQ, < Session-Id > { Vendor-Specific-Application-Id } { Auth-Session-State } { Origin-Host } { Origin-Realm } [Destination-Host] { Destination-Realm } { User-Identity } [Service-Indication] [Server-Name] { Subs-Req-Type } 1*{ Data-Reference } *[AVP] *[Proxy-Info] *[Route-Record]

6.1.6 Subscribe-Notifications-Answer (SNA) Command

The Subscribe-Notifications-Answer (SNA) command, indicated by the Command-Code field set to 308 and the 'R' bit cleared in the Command Flags field, is sent by a client in response to the Subscribe-Notifications-Request command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section 6.2 in addition to the values defined in [6].

Message Format

< Subscribe-Notifications-Answer > ::= ~~167772152~~16777217>	< Diameter Header: 308, PXY, < Session-Id > { Vendor-Specific-Application-Id } { Auth-Session-State } [Result-Code] [Experimental-Result] { Origin-Host } { Origin-Realm } ~~*[Data-Reference]~~ *[AVP] *[Failed-AVP] *[Proxy-Info] *[Route-Record]

6.1.7 Push-Notification-Request (PNR) Command

The Push-Notification-Request (PNR) command, indicated by the Command-Code field set to 309 and the 'R' bit set in the Command Flags field, is sent by a Diameter server to a Diameter client in order to notify changes in the user data in the server.

Message Format

< Push-Notification-Request > ::=< Diameter Header: 309, ~~167772152~~16777217, ~~-~~REQ, PXY, 16777217 >

< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{ Destination-Host }
{ Destination-Realm }
{ User-Identity }
{ User-Data }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.8 Push-Notifications-Answer (PNA) Command

The Push-Notifications-Answer (PNA) command, indicated by the Command-Code field set to 309 and the 'R' bit cleared in the Command Flags field, is sent by a client in response to the Push-Notification-Request command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section 6.2 in addition to the values defined in [6].

Message Format

< Push-Notification-Answer > ::=< Diameter Header: 309, PXY, ~~16777215~~16777217>
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.2 Experimental-Result-Code AVP values

This section defines new result code values that must be supported by all Diameter implementations that conform to this specification. The result codes defined in [6] are also applicable. When one of the result codes defined here is included in a response, it shall be inside a Experimental-Result AVP and Result-Code AVP shall be absent.

6.2.1 Success

The Result codes within the success category are used to inform a peer that a request has been successfully completed.

6.2.2 Permanent Failures

Errors that fall within the Permanent Failures category are used to inform the peer that the request failed, and should not be attempted again.

DIAMETER_ERROR_USER_DATA_NOT_RECOGNIZED (5100)

The data required, in the XML schema, does not match that which is specified within the HSS.

DIAMETER_ERROR_OPERATION_NOT_ALLOWED (5101)

The requested operation is not allowed for the user

DIAMETER_ERROR_USER_DATA_CANNOT_BE_READ (5102)

The requested user data is not allowed to be read.

DIAMETER_ERROR_USER_DATA_CANNOT_BE_MODIFIED (5103)

The requested user data is not allowed to be modified.

DIAMETER_ERROR_USER_DATA_CANNOT_BE_NOTIFIED (5104)

The requested user data is not allowed to be notified on changes.

DIAMETER_ERROR_TOO_MUCH_DATA (5008)

The size of the data pushed to the receiving entity exceeds its capacity. This error code is defined in [6].

DIAMETER_ERROR_TRANSPARENT_DATA_OUT_OF_SYNC (5105)

The request to update the repository data at the HSS could not be completed because the requested update is based on an out-of-date version of the repository data. That is, the sequence number in the Sh-Update Request message, does not match with the immediate successor of the associated sequence number stored for that repository data at the HSS. It is also used where an AS tries to create a new set of repository data when the identified repository data already exists in the HSS.

6.2.3 Transient Failures

Errors that fall within the transient failures category are those used to inform a peer that the request could not be satisfied at the time that it was received. The request may be able to be satisfied in the future.

6.2.3.1 DIAMETER_USER_DATA_NOT_AVAILABLE (4100)

The requested user data is not available at this time to satisfy the requested operation.

6.2.3.2 DIAMETER_PRIOR_UPDATE_IN_PROGRESS (4101)

The request to update the repository data at the HSS could not be completed because the related repository data is currently being updated by another entity.

6.3 AVPs

The following table describes the Diameter AVPs defined for the Sh interface protocol, their AVP Code values, types, possible flag values and whether the AVP may or not be encrypted.

Table 6.3.1: Diameter Multimedia Application AVPs

				AVP Flag rules				
Attribute Name	**AVP Code**	**Section defined**	**Value Type**	**Must**	**May**	**Should not**	**Must not**	**May Encr.**
User-Identity	~~7~~700	6.3.1	Grouped	M, V				N
MSISDN	~~+~~701	6.3.2	OctetString	M, V				N
User-Data	~~+~~702	6.3.3	OctetString	M, V				N
Data-Reference	~~+~~703	6.3.4	Enumerated	M, V				
Service-Indication	~~+~~704	6.3.5	OctetString	M, V				N
Subs-Req-Type	~~+~~705	6.3.6	Enumerated	M, V				N
Requested-Domain	~~+~~706	6.3.7	Enumerated	M, V				N
Current-Location	~~+~~707	6.3.8	Enumerated	M, V				N

Server-Name	~~3~~602	6.3.9	UTF8String	M, V				N
Public-Identity	6012~~2~~	6.3.10	UTF8String	M, V				N
NOTE 1: The AVP header bit denoted as 'M', indicates whether support of the AVP is required. The AVP header bit denoted as 'V', indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see [6]. NOTE 2: Depending on the concrete command.								

6.3.1 User-Identity AVP

The User-Identity AVP ~~(AVP Code 100)~~ is of type Grouped. This AVP contains either a ~~user-P~~public I~~i~~dentity AVP or MSISDN AVP.~~.~~

AVP format

User-Identity ::= <AVP header: 100 10415>

*[Public-Identity]

*[MSISDN]

*[AVP]

6.3.2 MSISDN AVP

The MSISDN AVP ~~(AVP Code 101)~~ is of type OctetString. This AVP contains an MSISDN with the format described in [8].

6.3.3 User-Data AVP

The User-Data AVP ~~(AVP Code 102)~~ is of type OctetString. This AVP contains the user data requested in the UDR and SNR operations and the data to be modified in the PUR operation. The exact content and format of this AVP is described in [1].

6.3.4 Data-Reference AVP

The Data-Reference AVP ~~(AVP code 103)~~ is of type Enumerated, and indicates the type of the requested user data in the operation UDR and SNR. Its exact values and meaning is defined in [1]. The following values are defined (more details are given in [1]):

RepositoryData (0)

IMSPublicIdenti~~fiers~~ty (10)

This value is used to request the read or notification of changes in the IMS public identities fields

IMSUserState (11)

S-CSCFName (12)

InitialFilterCriteria (13)

This value is used to request initial filter criteria relevant to the requesting AS

LocationInformation (14)

UserState (15)

ChargingInformation (16)

MSISDN (17)

6.3.5 Service-Indication AVP

The Service-Indication AVP ~~(AVP code 104)~~ is of type OctetString. This AVP contains the Service Indication that identifies a service in an AS.

6.3.6 Subs-Req-Type AVP

The Subs-Req-Type AVP ~~(AVP code 105)~~ is of type Enumerated, and indicates the type of the subscription-to-notifications request. The following values are defined:

Subscribe (0)

This value is used by an AS to subscribe to notifications of changes in data.

Unsubscribe (1)

This value is used by an AS to unsubscribe to notifications of changes in data

6.3.7 Requested-Domain AVP

The Requested-Domain AVP ~~(AVP code 106)~~ is of type Enumerated, and indicates the access domain for which certain data (e.g. user state) are requested. The following values are defined:

CS-Domain (0)

The requested data apply to the CS domain.

PS-Domain (1)

The requested data apply to the PS domain.

6.3.8 Current-Location AVP

The Current-Location AVP ~~(AVP code 107)~~ is of type Enumerated, and indicates whether an active location retrieval has to be initiated or not:

DoNotNeedInitiateActiveLocationRetrieval (0)

The request indicates that the initiation of an active location retrieval is not required.

InitiateActiveLocationRetrieval (1)

It is requested that an active location retrieval is initiated.

6.3.9 Server-Name AVP

The Server-Name AVP contains a SIP-URL used to identify an AS. See [6] for further description of this AVP.

6.3.10 Public-Identity AVP

The Public-Identity AVP contains a Public User Identity. See [6] for the definition of this AVP.

6.4 Use of namespaces

This clause contains the namespaces that have either been created in this specification, or the values assigned to existing namespaces managed by IANA.

6.4.1 AVP codes

This specification assigns the AVP values ~~100-107~~ from the AVP Code namespace managed by 3GPP for its Diameter vendor-specific applications. See section 6.3 for the assignment of the namespace in this specification.

6.4.2 Experimental-Result-Code AVP values

This specification has assigned Experimental-Result-Code AVP values 4100-4101 and 5100-5105. See section 6.2.

6.4.3 Command Code values

This specification assigns the AVP values ~~306-309~~ from the range allocated by IANA to 3GPP in [7].

6.4.4 Application-ID value

IANA has allocated the value ~~16777215~~16777217 for the 3GPP Sh interface application.

~~7 Special Requirements~~

~~7.1 Version Control~~

~~The same mechanisms specified in [6] also apply to this specification.~~