

1 3GPP2 X.S0013-011-0  
2 Version 1.0  
3 Version Date: December 2003



3RD GENERATION  
PARTNERSHIP  
PROJECT 2  
"3GPP2"

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

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### **Sh Interface based on Diameter Protocols Protocol Details – Stage 3**

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- 1 No Text.
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**All-IP Core Network Multimedia Domain  
Sh Interface based on Diameter Protocols  
Protocol Details – Stage 3**

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9 **Revision History**

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Revision	Changes	Date
0	Initial Publication	December 2003

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- 1
- 2 No Text.

## 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] TIA-873-010: "IP Multimedia (IM) Subsystem Sh interface; signalling flows and message contents".

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

[2] void

[3] Internet Engineering Task Force (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] TIA-873-006: "Cx Interface based on Diameter protocol; protocol details".

3GPP2 X.S0013-006: "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.

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

2 **Server:** SIP-server.

3 **User data:** user profile data.

## 4 **3.2 Abbreviations**

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

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

## 21 **4 General**

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

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

## 27 **5 Use of the Diameter base protocol**

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

## 30 **6 Diameter application for Sh interface**

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

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

34 The Sh interface protocol is defined as an IETF vendor specific Diameter application, where the vendor is  
 35 3GPP. The vendor identifier assigned by IANA to 3GPP ( [http://www.iana.org/assignments/enterprise-](http://www.iana.org/assignments/enterprise-numbers)  
 36 numbers) is 10415.

37 The Diameter application identifier assigned to the Sh interface application is 167772152 .

### 38 **6.1 Command-Code values**

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

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

3 The command codes for the Sh interface application are taken from the range allocated by IANA in [7] as  
4 assigned in this specification. For these commands, the Application-ID field shall be set to 167772152  
5 (application identifier of the Sh interface application).

6 The following Command Codes are defined in this specification:

7 **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

8

### 9 **6.1.1 User-Data-Request (UDR) Command**

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

13 Message Format

```

14 < User-Data -Request> ::= < Diameter Header:306, 167772152, REQ, PXY >
15 < Session-Id >
16 { Vendor-Specific-Application-Id }
17 { Auth-Session-State }
18 { Origin-Host }
19 { Origin-Realm }
20 [ Destination-Host ]
21 { Destination-Realm }
22 { User-Identity }
23 [ Service-Indication ]
24 [Server-Name]
25 1*{ Data-Reference }
26 *[ Requested-Domain ]
27 [ Current-Location ]
28 *[ AVP ]
29 *[ Proxy-Info ]
30 *[ Route-Record ]

```

### 31 **6.1.2 User-Data-Answer (UDA) Command**

32 The User-Data-Answer (UDA) command, indicated by the Command-Code field set to 306 and the 'R' bit  
33 cleared in the Command Flags field, is sent by a server in response to the User-Data-Request command.

1 The Result-Code or Experimental-Result AVP may contain one of the values defined in section 6.2 in  
2 addition to the values defined in [6].

3 Message Format

```
4         < User-Data-Answer > ::=          < Diameter Header: 306, TDB >
5                                         < Session-Id >
6                                         { Vendor-Specific-Application-Id }
7                                         [ Result-Code ]
8                                         [ Experimental-Result ]
9                                         { Auth-Session-State }
10                                        { Origin-Host }
11                                        { Origin-Realm }
12                                        [ User-Data ]
13                                        *[ AVP ]
14                                        *[ Proxy-Info ]
15                                        *[ Route-Record ]
```

### 16 6.1.3 Profile-Update-Request (PUR) Command

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

20 Message Format

```
21         < Profile-Update-Request > ::=    < Diameter Header: 307, 167772152, REQ, PXY >
22                                         < Session-Id >
23                                         { Vendor-Specific-Application-Id }
24                                         { Auth-Session-State }
25                                         { Origin-Host }
26                                         { Origin-Realm }
27                                         { Destination-Host }
28                                         { Destination-Realm }
29                                         { User-Identity }
30                                         { User-Data }
31                                         *[ AVP ]
32                                         *[ Proxy-Info ]
33                                         *[ Route-Record ]
```

### 34 6.1.4 Profile-Update-Answer (PUA) Command

35 The Profile-Update-Answer (PUA) command, indicated by the Command-Code field set to 307 and the ‘R’  
36 bit cleared in the Command Flags field, is sent by a client in response to the Profile-Update-Request  
37 command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section  
38 6.2 in addition to the values defined in [6].

39 Message Format

```
40         < Profile-Update-Answer > ::=    < Diameter Header: 307, 167772152>
41                                         < Session-Id >
42                                         { Vendor-Specific-Application-Id }
43                                         [ Result-Code ]
44                                         [ Experimental-Result ]
45                                         { Auth-Session-State }
46                                         { Origin-Host }
47                                         { Origin-Realm }
48                                         *[ AVP ]
49                                         *[ Proxy-Info ]
```



```

1           { Auth-Session-State }
2           { Origin-Host }
3           { Origin-Realm }
4           { Destination-Host }
5           { Destination-Realm }
6           { User-Identity }
7           { User-Data }
8           *[ AVP ]
9           *[ Proxy-Info ]
10          *[ Route-Record ]

```

### 11 **6.1.8 Push-Notifications-Answer (PNA) Command**

12 The Push-Notifications-Answer (PNA) command, indicated by the Command-Code field set to 309 and the  
13 'R' bit cleared in the Command Flags field, is sent by a client in response to the Push-Notification-Request  
14 command. The Result-Code or Experimental-Result AVP may contain one of the values defined in section  
15 6.2 in addition to the values defined in [6].

16 Message Format

```

17     < Push-Notification-Answer > ::= < Diameter Header: 309, 167772152 >
18     < Session-Id >
19     { Vendor-Specific-Application-Id }
20     [ Result-Code ]
21     [ Experimental-Result ]
22     { Auth-Session-State }
23     { Origin-Host }
24     { Origin-Realm }
25     *[ AVP ]
26     *[ Proxy-Info ]
27     *[ Route-Record ]

```

## 28 **6.2 Experimental-Result-Code AVP values**

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

### 33 **6.2.1 Success**

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

### 36 **6.2.2 Permanent Failures**

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

39 DIAMETER\_ERROR\_USER\_DATA\_NOT\_RECOGNIZED (5100)

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

41 DIAMETER\_ERROR\_OPERATION\_NOT\_ALLOWED (5101)

42 The requested operation is not allowed for the user

43 DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_READ (5102)

44 The requested user data is not allowed to be read.

45 DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_MODIFIED (5103)

1 The requested user data is not allowed to be modified.

2 DIAMETER\_ERROR\_USER\_DATA\_CANNOT\_BE\_NOTIFIED (5104)

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

4 DIAMETER\_ERROR\_TOO\_MUCH\_DATA (5008)

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

6 DIAMETER\_ERROR\_TRANSPARENT\_DATA\_OUT\_OF\_SYNC (5105)

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

## 12 6.2.3 Transient Failures

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

### 15 6.2.3.1 DIAMETER\_USER\_DATA\_NOT\_AVAILABLE (4100)

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

### 17 6.2.3.2 DIAMETER\_PRIOR\_UPDATE\_IN\_PROGRESS (4101)

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

## 20 6.3 AVPs

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

23

**Table 6.3.1: Diameter Multimedia Application AVPs**

Attribute Name	AVP Code	Section defined	Value Type	AVP Flag rules				
				Must	May	Should not	Must not	May Encr.
User-Identity	100	6.3.1	Grouped	M, V				N
MSISDN	101	6.3.2	OctetString	M, V				N
User-Data	102	6.3.3	OctetString	M, V				N
Data-Reference	103	6.3.4	Enumerated	M, V				
Service-Indication	104	6.3.5	OctetString	M, V				N
Subs-Req-Type	105	6.3.6	Enumerated	M, V				N
Requested-Domain	106	6.3.7	Enumerated	M, V				N
Current-Location	107	6.3.8	Enumerated	M, V				N
Server-Name	3	6.3.9	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.

1

### 2 **6.3.1 User-Identity AVP**

3 The User-Identity AVP (AVP Code 100) is of type Grouped. This AVP contains a user public identity.

4 AVP format

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

6 \***[Public-Identity]**

7 \***[MSISDN]**

8 \***[AVP]**

### 9 **6.3.2 MSISDN AVP**

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

### 12 **6.3.3 User-Data AVP**

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

### 16 **6.3.4 Data-Reference AVP**

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

20 RepositoryData (0)

21 PublicIdentifiers (10)

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

23 IMSUserState (11)

24 S-CSCFName (12)

25 InitialFilterCriteria (13)

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

27 LocationInformation (14)

28 UserState (15)

29 ChargingInformation (16)

### 30 **6.3.5 Service-Indication AVP**

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

### 1 **6.3.6 Subs-Req-Type AVP**

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

4       Subscribe (0)

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

6       Unsubscribe (1)

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

### 8 **6.3.7 Requested-Domain AVP**

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

11       CS-Domain (0)

12           The requested data apply to the CS domain.

13       PS-Domain (1)

14           The requested data apply to the PS domain.

### 15 **6.3.8 Current-Location AVP**

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

18       DoNotNeedInitiateActiveLocationRetrieval (0)

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

20       InitiateActiveLocationRetrieval (1)

21           It is requested that an active location retrieval is initiated.

### 22 **6.3.9 Server-Name AVP**

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

## 24 **6.4 Use of namespaces**

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

### 27 **6.4.1 AVP codes**

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

### 31 **6.4.2 Experimental-Result-Code AVP values**

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

### 34 **6.4.3 Command Code values**

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

- 1 **6.4.4 Application-ID value**
- 2 IANA has allocated the value 167772152for the 3GPP Sh interface application.

## 3 **7 Special Requirements**

### 4 **7.1 Version Control**

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

6