PacketCable™ 2.0
IMS Delta Specifications

Cx/Dx Interfaces based on the Diameter Protocol Specification
3GPP TS 29.229

PKT-SP-29.229-I01-060914

ISSUED

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Key to Document Status Codes:

Work in Progress	An incomplete document, designed to guide discussion and generate feedback that may include several alternative requirements for consideration.
Draft	A document in specification format considered largely complete, but lacking review by Members and vendors. Drafts are susceptible to substantial change during the review process.
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Abstract

This CableLabs-modified 3GPP technical specification includes the cable-specific requirements necessary for implementing 3GPP technical specifications in PacketCable and the delivery of PacketCable services.

Because these are modified 3GPP documents, their document formatting has been retained except as follows. Changes to the original 3GPP requirements are shown in this document by color coding of text. Unchanged text appears normal, while new text appears in blue underline and deleted 3GPP text appears as ~~violet strikethrough hidden text~~. To view the deleted 3GPP text, the reader must have Word configured so the 'view hidden text' is turned on.

The intended audience for this document includes developers of equipment intended to be conformant to PacketCable specifications.

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Contents

Foreword

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

The contents of the present document are subject to continuing work within the 3GPP TSG organization and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be updated and re-released by CableLabs. ~~the TSG with an identifying change of release date and an increase in version number as follows:~~

~~Version x.y.z~~

~~where:~~

~~x the first digit:~~

~~1 presented to TSG for information;~~

~~2 presented to TSG for approval;~~

~~3 or greater indicates TSG approved document under change control.~~

~~y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.~~

~~z the third digit is incremented when editorial only changes have been incorporated in the document.~~

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 Cx interface between the I-CSCF/S-CSCF and the HSS.
- The Dx interface between the I-CSCF/S-CSCF and the SLF.

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 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

- PacketCable defines several specifications which are based on 3GPP technical specifications. These PacketCable specifications are commonly referred to as PacketCable Delta specifications. For references within this specification which have a corresponding PacketCable Delta specification, the PacketCable Delta specification must be used. The list of PacketCable Delta specifications is:

PKT-SP-23.008	PKT-SP-29.228
PKT-SP-23.218	PKT-SP-29.229
PKT-SP-23.228	PKT-SP-33.203
PKT-SP-24.229	PKT-SP-33.210
PKT-SP-29.109	PKT-SP-33.220

References which have corresponding delta specifications are highlighted with an *.

[1] *3GPP TS 29.228 "IP Multimedia (IM) Subsystem Cx and Dx interface; signalling flows and message contents"

[2] *3GPP TS 33.210 "3G Security; Network Domain Security; IP Network Layer Security"

[3] IETF RFC 3261 "SIP: Session Initiation Protocol"

[4] IETF RFC 2396÷ "Uniform Resource Identifiers (URI): generic syntax"

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

[6] IETF RFC 3588 "Diameter Base Protocol"

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

[8] IETF RFC 3966 "The tel URI for Telephone Numbers"

[9] void

[10] IETF RFC 3309: "SCTP Checksum Change"

[11] *3GPP TS 29.329 "Sh Interface based on the Diameter protocol; protocol details"

[12] IETF RFC 3589 "Diameter Command Codes for Third Generation Partnership Project (3GPP) Release 5"

[13] IETF RFC 2617 "HTTP Authentication: Basic and Digest Access Authentication"

3 Definitions, symbols and abbreviations

3.1 Definitions

Refer to IETF RFC 3588 [6] 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 IETF RFC 3588 [6], it corresponds to an Information Element in a Diameter message.

Diameter Multimedia client: a client that implements the Diameter Multimedia application. The client is one of the communicating Diameter peers that usually initiate transactions. Examples in 3GPP are the I-CSCF and S-CSCF.

Diameter Multimedia server: a server that implements the Diameter Multimedia application. A Diameter Multimedia server that also supported the NASREQ and MobileIP applications would be referred to as a Diameter server. An example of a Diameter Multimedia server in 3GPP is the HSS.

Registration: SIP-registration.

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
ABNF	Augmented Backus-Naur Form
AVP	Attribute-Value Pair
CN	Core Network
CSCF	Call Session Control Function
HSS	Home Subscriber Server
IANA	Internet Assigned Numbers Authority
I-CSCF	Interrogating CSCF
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
NDS	Network Domain Security
RFC	Request For Comments
S-CSCF	Serving CSCF
SCTP	Stream Control Transport Protocol
SIP	Session Initiation Protocol
SLF	Server Locator Function
UCS	Universal Character Set
URL	Uniform Resource Locator
UTF	UCS Transformation Formats

4 General

The Diameter Base Protocol as specified in IETF RFC 3588 [6] 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 5 of this specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) are unmodified.

5 Use of the Diameter base protocol

With the clarifications listed in the following subclauses the Diameter Base Protocol defined by IETF RFC 3588 [6] shall apply.

5.1 Securing Diameter Messages

For secure transport of Diameter messages, see 3GPP TS 33.210 [2].

5.2 Accounting functionality

Accounting functionality (Accounting Session State Machine, related command codes and AVPs) is not used on the Cx interface.

5.3 Use of sessions

Both between the I-CSCF and the HSS and between the S-CSCF and the HSS, Diameter sessions are implicitly terminated. An implicitly terminated session is one for which the server does not maintain state information. The client does not need to send any re-authorization or session termination requests to the server.

The Diameter base protocol includes the Auth-Session-State AVP as the mechanism for the implementation of implicitly terminated sessions.

The client (server) shall include in its requests (responses) the Auth-Session-State AVP set to the value NO_STATE_MAINTAINED (1), as described in IETF RFC 3588 [6]. As a consequence, the server does not maintain any state information about this session and the client does not need to send any session termination request. Neither the Authorization-Lifetime AVP nor the Session-Timeout AVP shall be present in requests or responses.

5.4 Transport protocol

Diameter messages over the Cx interface shall make use of SCTP IETF RFC 2960 [5] and shall utilise the new SCTP checksum method specified in RFC 3309 [10].

5.5 Routing considerations

This clause specifies the use of the Diameter routing AVPs Destination-Realm and Destination-Host.

If an I-CSCF or S-CSCF knows the address/name of the HSS for a certain user, both the Destination-Realm and Destination-Host AVPs shall be present in the request. Otherwise, only the Destination-Realm AVP shall be present and the command shall be routed to the next Diameter node, e.g. the SLF (see 3GPP TS 29.228 [1]), based on the Diameter routing table in the client. Once the redirector function (SLF) has returned the address or the destination HSS (using Redirect-Host AVP), the redirected request to the HSS shall include both Destination-Realm and Destination-Host AVPs. Consequently, the Destination-Host AVP is declared as optional in the ABNF for all requests initiated by an I-CSCF or an S-CSCF. The S-CSCF shall store the address of the HSS for each user, after a first request sent to the redirector function.

Requests initiated by the HSS towards an S-CSCF shall include both Destination-Host and Destination-Realm AVPs. The HSS obtains the Destination-Host AVP to use in requests towards an S-CSCF, from the Origin-Host AVP received in previous requests from the S-CSCF. Consequently, the Destination-Host AVP is declared as mandatory in the ABNF for all requests initiated by the HSS.

Destination-Realm AVP is declared as mandatory in the ABNF for all requests.

5.6 Advertising Application Support

The HSS, S-CSCF and I-CSCF shall advertise support of the Diameter Multimedia Application by including the value of the application identifier (see chapter 6) in the Auth-Application-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands.

The vendor identifier values of 3GPP (10415) and CableLabs (4491) shall be included in the Supported-Vendor-Id AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands, and in the Vendor-Id AVP within the Vendor-Specific-Application-Id grouped AVP of the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands.

Note: The Vendor-Id AVP included in Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands that is not included in the Vendor-Specific-Application-Id AVPs as described above shall indicate the manufacturer of the Diameter node as per RFC 3588 [6].

6 Diameter application for Cx interface

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

- to exchange location information
- to authorize a user to access the IMS
- to exchange authentication information
- to download and handle changes in the user data stored in the server

The Cx 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 Cx/Dx interface application is 16777216 (allocated by IANA).

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 IETF RFC 2234 [7], according to the rules in IETF RFC 3588 [6]. Whenever the definition and use of an AVP is not specified in this document, what is stated in IETF RFC 3588 [6] shall apply.

The command codes for the Cx/Dx interface application are taken from the range allocated by IANA in IETF RFC 3589 [12] as assigned in this specification. For these commands, the Application-ID field shall be set to 16777216 (application identifier of the Cx/Dx interface application, allocated by IANA).

The following Command Codes are defined in this specification:

Table 6.1.1: Command-Code values

Command-Name	Abbreviation	Code	Section
User-Authorization-Request	UAR	300	6.1.1
User-Authorization-Answer	UAA	300	6.1.2
Server-Assignment-Request	SAR	301	6.1.3
Server-Assignment-Answer	SAA	301	6.1.4
Location-Info-Request	LIR	302	6.1.5
Location-Info-Answer	LIA	302	6.1.6
Multimedia-Auth-Request	MAR	303	6.1.7
Multimedia-Auth-Answer	MAA	303	6.1.8
Registration-Termination-Request	RTR	304	6.1.9
Registration-Termination-Answer	RTA	304	6.1.10
Push-Profile-Request	PPR	305	6.1.11
Push-Profile-Answer	PPA	305	6.1.12

6.1.1 User-Authorization-Request (UAR) Command

The User-Authorization-Request (UAR) command, indicated by the Command-Code field set to 300 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia client to a Diameter Multimedia server in order to request the authorization of the registration of a multimedia user.

Message Format

```
< User-Authorization-Request> ::=          < Diameter Header: 300, REQ, PXY,
16777216 >
                                                    < Session-Id >
                                                    { Vendor-Specific-Application-Id }
                                           { Auth-Session-State }
                                           { Origin-Host }
                                           { Origin-Realm }
                                           [ Destination-Host ]
                                                    { Destination-Realm }
                                           { User-Name }
                                           *[ Supported-Features ]
                                           { Public-Identity }
                                           { Visited-Network-Identifier }
                                           [ User-Authorization-Type ]
                                                    *[ AVP ]
                                                    *[ Proxy-Info ]
```

*[Route-Record]

6.1.2 User-Authorization-Answer (UAA) Command

The User-Authorization-Answer (UAA) command, indicated by the Command-Code field set to 300 and the 'R' bit cleared in the Command Flags field, is sent by a server in response to the User-Authorization-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2.

Message Format

< User-Authorization-Answer> ::= < Diameter Header: 300, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
***[Supported-Features]**
[Server-Name]
[Server-Capabilities]
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.3 Server-Assignment-Request (SAR) Command

The Server-Assignment-Request (SAR) command, indicated by the Command-Code field set to 301 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia client to a Diameter Multimedia server in order to request it to store the name of the server that is currently serving the user.

Message Format

<Server-Assignment-Request> ::= < Diameter Header: 301, REQ, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[Destination-Host]
{ Destination-Realm }
[User-Name]
***[Supported-Features]**
***[Public-Identity]**
{ Server-Name }
{ Server-Assignment-Type }
{ User-Data-Already-Available }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.4 Server-Assignment-Answer (SAA) Command

The Server-Assignment-Answer (SAA) command, indicated by the Command-Code field set to 301 and the 'R' bit cleared in the Command Flags field, is sent by a server in response to the Server-Assignment-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2. If Result-Code or Experimental-Result does not inform about an error, the User-Data AVP shall contain the information that the S-CSCF needs to give service to the user.

Message Format

<Server-Assignment-Answer> ::=< Diameter Header: 301, PXY, 16777216 >
< Session-Id >
Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[User-Name]
***[Supported-Features]**
[User-Data]
[Charging-Information]
[Associated-Identities]
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.5 Location-Info-Request (LIR) Command

The Location-Info-Request (LIR) command, indicated by the Command-Code field set to 302 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia client to a Diameter Multimedia server in order to request name of the server that is currently serving the user.

Message Format

<Location-Info-Request> ::= < Diameter Header: 302, REQ, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[Destination-Host]
{ Destination-Realm }
***[Supported-Features]**
{ Public-Identity }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.6 Location-Info-Answer (LIA) Command

The Location-Info-Answer (LIA) command, indicated by the Command-Code field set to 302 and the 'R' bit cleared in the Command Flags field, is sent by a server in response to the Location-Info-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2.

Message Format

<Location-Info-Answer> ::= < Diameter Header: 302, PXY, 16777216 >
< Session-Id >
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
***[Supported-Features]**
[Server-Name]
[Server-Capabilities]
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.7 Multimedia-Auth-Request (MAR) Command

The Multimedia-Auth-Request (MAR) command, indicated by the Command-Code field set to 303 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia client to a Diameter Multimedia server in order to request security information.

Message Format

< Multimedia-Auth-Request > ::= < Diameter Header: 303, REQ, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{ Destination-Realm }
[Destination-Host]
{ User-Name }
***[Supported-Features]**
{ Public-Identity }
[SIP-Auth-Data-Item]
[SIP-Number-Auth-Items]
{ Server-Name }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.8 Multimedia-Auth-Answer (MAA) Command

The Multimedia-Auth-Answer (MAA) command, indicated by the Command-Code field set to 303 and the 'R' bit cleared in the Command Flags field, is sent by a server in response to the Multimedia-Auth-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2.

Message Format

< Multimedia-Auth-Answer > ::= < Diameter Header: 303, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }

{ Origin-Realm }
[User-Name]
***[Supported-Features]**
[Public-Identity]
[SIP-Number-Auth-Items]
***[SIP-Auth-Data-Item]**
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.1.9 Registration-Termination-Request (RTR) Command

The Registration-Termination-Request (RTR) command, indicated by the Command-Code field set to 304 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia server to a Diameter Multimedia client in order to request the de-registration of a user.

Message Format

<Registration-Termination-Request> ::= < Diameter Header: 304, REQ, PXY, 16777216 >
< Session-Id >{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{ Destination-Host }
{ Destination-Realm }
{ User-Name }
[Associated-Identities]
***[Supported-Features]**
***[Public-Identity]**
{ Deregistration-Reason }
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.10 Registration-Termination-Answer (RTA) Command

The Registration-Termination-Answer (RTA) command, indicated by the Command-Code field set to 304 and the 'R' bit cleared in the Command Flags field, is sent by a client in response to the Registration-Termination-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2.

Message Format

<Registration-Termination-Answer> ::= < Diameter Header: 304, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[Associated-Identities]
***[Supported-Features]**
*[AVP]
*[Failed-AVP]
*[Proxy-Info]

*[Route-Record]

6.1.11 Push-Profile-Request (PPR) Command

The Push-Profile-Request (PPR) command, indicated by the Command-Code field set to 305 and the 'R' bit set in the Command Flags field, is sent by a Diameter Multimedia server to a Diameter Multimedia client in order to update the subscription data of a multimedia user in the Diameter Multimedia client whenever a modification has occurred in the subscription data that constitutes the data used by the client.

Message Format

< Push-Profile-Request > ::= < Diameter Header: 305, REQ, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
{ Destination-Host }
{ Destination-Realm }
{ User-Name }
***[Supported-Features]**
[User-Data]
[Charging-Information]
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.1.12 Push-Profile-Answer (PPA) Command

The Push-Profile-Answer (PPA) command, indicated by the Command-Code field set to 305 and the 'R' bit cleared in the Command Flags field, is sent by a client in response to the Push-Profile-Request command. The Experimental-Result AVP may contain one of the values defined in section 6.2.

Message Format

< Push-Profile-Answer > ::= < Diameter Header: 305, PXY, 16777216 >
< Session-Id >
{ Vendor-Specific-Application-Id }
[Result-Code]
[Experimental-Result]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
***[Supported-Features]**
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.2 Result-Code AVP values

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

6.2.1 Success

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

6.2.1.1 DIAMETER_FIRST_REGISTRATION (2001)

The HSS informs the I-CSCF that:

- The user is authorized to register this public identity;
- A S-CSCF shall be assigned to the user.

6.2.1.2 DIAMETER_SUBSEQUENT_REGISTRATION (2002)

The HSS informs the I-CSCF that:

- The user is authorized to register this public identity;
- A S-CSCF is already assigned and there is no need to select a new one.

6.2.1.3 DIAMETER_UNREGISTERED_SERVICE (2003)

The HSS informs the I-CSCF that:

- The public identity is not registered but has services related to unregistered state;
- A S-CSCF shall be assigned to the user.

6.2.1.4 DIAMETER_SUCCESS_SERVER_NAME_NOT_STORED (2004)

The HSS informs to the S-CSCF that:

- The de-registration is completed;
- The S-CSCF name is not stored in the HSS.

6.2.1.5 DIAMETER_SERVER_SELECTION (2005)

The HSS informs the I-CSCF that:

- The user is authorized to register this public identity;
- A S-CSCF is already assigned for services related to unregistered state;
- It may be necessary to assign a new S-CSCF to the user.

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.

6.2.2.1 DIAMETER_ERROR_USER_UNKNOWN (5001)

A message was received for a user that is unknown.

6.2.2.2 DIAMETER_ERROR_IDENTITIES_DONT_MATCH (5002)

A message was received with a public identity and a private identity for a user, and the server determines that the public identity does not correspond to the private identity.

6.2.2.3 DIAMETER_ERROR_IDENTITY_NOT_REGISTERED (5003)

A query for location information is received for a public identity that has not been registered before. The user to which this identity belongs cannot be given service in this situation.

6.2.2.4 DIAMETER_ERROR_ROAMING_NOT_ALLOWED (5004)

The user is not allowed to roam in the visited network.

6.2.2.5 DIAMETER_ERROR_IDENTITY_ALREADY_REGISTERED (5005)

The identity being registered has already a server assigned and the registration status does not allow that it is overwritten.

6.2.2.6 DIAMETER_ERROR_AUTH_SCHEME_NOT_SUPPORTED (5006)

The authentication scheme indicated in an authentication request is not supported.

6.2.2.7 DIAMETER_ERROR_IN_ASSIGNMENT_TYPE (5007)

The identity being registered has already the same server assigned and the registration status does not allow the server assignment type.

6.2.2.8 DIAMETER_ERROR_TOO_MUCH_DATA (5008)

The volume of the data pushed to the receiving entity exceeds its capacity.

NOTE: This error code is also used in 3GPP TS 29.329 [11].

6.2.2.9 DIAMETER_ERROR_NOT_SUPPORTED_USER_DATA (5009)

The S-CSCF informs HSS that the received subscription data contained information, which was not recognised or supported.

6.2.2.10 Void

6.2.2.11 DIAMETER_ERROR_FEATURE_UNSUPPORTED (5011)

A request application message was received indicating that the origin host requests that the command pair would be handled using a feature which is not supported by the destination host.

6.3 AVPs

The following tables describe the Diameter AVPs defined for the Cx interface protocol, their AVP Code values, types, possible flag values and whether or not the AVP may be encrypted. The Vendor-Id header of all AVPs defined in Table 6.3.1 shall be set to 3GPP (10415). The Vendor-Id header of all AVPs defined in table 6.3.2 shall be set to CableLabs (4491).

Table 6.3.1: Diameter Multimedia Application AVPs with 3GPP Vendor-Id

				AVP Flag rules				
Attribute Name	**AVP Code**	**Section defined**	**Value Type**	**Must**	**May**	**Should not**	**Must not**	**May Encr.**
Visited-Network-Identifier	600	6.3.1	OctetString	M, V				No
Public-Identity	601	6.3.2	UTF8String	M, V				No
Server-Name	602	6.3.3	UTF8String	M, V				No
Server-Capabilities	603	6.3.4	Grouped	M, V				No
Mandatory-Capability	604	6.3.5	Unsigned32	M, V				No
Optional-Capability	605	6.3.6	Unsigned32	M, V				No
User-Data	606	6.3.7	OctetString	M, V				No
SIP-Number-Auth-Items	607	6.3.8	Unsigned32	M, V				No
SIP-Authentication-Scheme	608	6.3.9	UTF8String	M, V				No
SIP-Authenticate	609	6.3.10	OctetString	M, V				No
SIP-Authorization	610	6.3.11	OctetString	M, V				No
SIP-Authentication-Context	611	6.3.12	OctetString	M, V				No
SIP-Auth-Data-Item	612	6.3.13	Grouped	M, V				No
SIP-Item-Number	613	6.3.14	Unsigned32	M, V				No
Server-Assignment-Type	614	6.3.15	Enumerated	M, V				No
Deregistration-Reason	615	6.3.16	Grouped	M, V				No
Reason-Code	616	6.3.17	Enumerated	M, V				No
Reason-Info	617	6.3.18	UTF8String	M, V				No
Charging-Information	618	6.3.19	Grouped	M, V				No
Primary-Event-Charging-Function-Name	619	6.3.20	DiameterURI	M, V				No
Secondary-Event-Charging-Function-Name	620	6.3.21	DiameterURI	M, V				No
Primary-Charging-Collection-Function-Name	621	6.3.22	DiameterURI	M, V				No
Secondary-Charging-Collection-Function-Name	622	6.3.23	DiameterURI	M, V				No
User-Authorization-Type	623	6.3.24	Enumerated	M, V				No

User-Data-Already-Available	624	6.3.26	Enumerated	M, V				No
Confidentiality-Key	625	6.3.27	OctetString	M, V				No
Integrity-Key	626	6.3.28	OctetString	M, V				No
Supported-Features	628	6.3.29	Grouped	V	M			No
Feature-List-ID	629	6.3.30	Unsigned32	V			M	No
Feature-List	630	6.3.31	Unsigned32	V			M	No
Supported-Applications	631	6.3.32	Grouped	V			M	No
Associated-Identities	632	6.3.33	Grouped	V			M	No
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 IETF RFC 3588 [6]. NOTE 2: Depending on the concrete command.								

Table 6.3.2: Diameter Multimedia Application AVPs with CableLabs Vendor-Id

				AVP Flag rules				
Attribute Name	**AVP Code**	**Section defined**	**Value Type**	**Must**	**May**	**Should not**	**Must not**	**May Encr.**
SIP-Digest-Authenticate	228	6.3.34	Grouped	M,V				No
Digest-Realm	209	6.3.35	UTF8String	M,V				No
Digest-Domain	206	6.3.36	UTF8String	M,V				No
Digest-Algorithm	204	6.3.37	UTF8String	M,V				No
Digest-QoP	208	6.3.38	UTF8String	M,V				No
Digest-HA1	207	6.3.39	OctetString	M,V				No
Digest-Auth-Param	205	6.3.40	OctetString	M,V				No
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 IETF RFC 3588 [6].								

6.3.1 Visited-Network-Identifier AVP

The Visited-Network-Identifier AVP is of type OctetString. This AVP contains an identifier that helps the home network to identify the visited network (e.g. the visited network domain name).

6.3.2 Public-Identity AVP

The Public-Identity AVP is of type UTF8String. This AVP contains the public identity of a user in the IMS. The syntax of this AVP corresponds either to a SIP URL (with the format defined in IETF RFC 3261 [3] and IETF RFC 2396 [4]) or a TEL URL (with the format defined in IETF RFC 3966 [8]).

6.3.3 Server-Name AVP

The Server-Name AVP is of type UTF8String. This AVP contains a SIP-URL (as defined in IETF RFC 3261 [3] and IETF RFC 2396 [4]), used to identify a SIP server (e.g. S-CSCF name).

6.3.4 Server-Capabilities AVP

The Server-Capabilities AVP is of type Grouped. This AVP contains information to assist the I-CSCF in the selection of an S-CSCF.

AVP format

Server-Capabilities ::= <AVP header: 603 10415>

*[Mandatory-Capability]

*[Optional-Capability]

*[Server-Name]

*[AVP]

6.3.5 Mandatory-Capability AVP

The Mandatory-Capability AVP is of type Unsigned32. The value included in this AVP can be used to represent a single determined mandatory capability of an S-CSCF. Each mandatory capability available in an individual operator's network shall be allocated a unique value. The allocation of these values to individual capabilities is an operator issue.

6.3.6 Optional-Capability AVP

The Optional-Capability AVP is of type Unsigned32. The value included in this AVP can be used to represent a single determined optional capability of an S-CSCF. Each optional capability available in an individual operator's network shall be allocated a unique value. The allocation of these values to individual capabilities is an operator issue.

6.3.7 User-Data AVP

The User-Data AVP is of type OctetString. This AVP contains the user data required to give service to a user. The exact content and format of this AVP is described in 3GPP TS 29.228 [1].

6.3.8 SIP-Number-Auth-Items AVP

The SIP-Number-Auth-Items AVP is of type Unsigned32.

When used in a request, the SIP-Number-Auth-Items indicates the number of authentication vectors the S-CSCF is requesting. This can be used, for instance, when the client is requesting several pre-calculated authentication vectors. In the answer message, the SIP-Number-Auth-Items AVP indicates the actual number of SIP-Auth-Data-Item AVPs provided by the Diameter server.

6.3.9 SIP-Authentication-Scheme AVP

The Authentication-Scheme AVP is of type UTF8String and indicates the authentication scheme used in the authentication of SIP messages.

6.3.10 SIP-Authenticate AVP

The SIP-Authenticate AVP is of type OctetString and contains specific parts of the data portion of the WWW-Authenticate or Proxy-Authenticate SIP headers that are to be present in a SIP response. The identification and encoding of the specific parts are defined in 3GPP TS 29.228 [1].

6.3.11 SIP-Authorization AVP

The SIP-Authorization AVP is of type OctetString and contains specific parts of the data portion of the Authorization or Proxy-Authorization SIP headers suitable for inclusion in a SIP request. The identification and encoding of the specific parts are defined in 3GPP TS 29.228 [1].

6.3.12 SIP-Authentication-Context AVP

The SIP-Authentication-Context AVP is of type OctectString, and contains authentication-related information relevant for performing the authentication but that is not part of the SIP authentication headers.

Some mechanisms (e.g. PGP, digest with quality of protection set to auth-int defined in IETF RFC 2617, digest with predictive nonces or sip access digest) request that part or the whole SIP request is passed to the entity performing the authentication. In such cases the SIP-Authentication-Context AVP would be carrying such information.

6.3.13 SIP-Auth-Data-Item AVP

The SIP-Auth-Data-Item is of type Grouped, and contains the authentication and/or authorization information for the Diameter client.

AVP format

SIP-Auth-Data-Item :: = < AVP Header : 612 10415 >

[SIP-Item-Number]

[SIP-Authentication-Scheme]

[SIP-Authenticate]

[SIP-Authorization]

[SIP-Authentication-Context]

[Confidentiality-Key]

[Integrity-Key]

[SIP-Digest-Authenticate]

* [AVP]

6.3.14 SIP-Item-Number AVP

The SIP-Item-Number AVP is of type Unsigned32, and is included in a SIP-Auth-Data-Item grouped AVP in circumstances where there are multiple occurrences of SIP-Auth-Data-Item AVP, and the order in which they should be processed is significant. In this scenario, SIP-Auth-Data-Item AVP with a low SIP-Item-Number value should be processed before SIP-Auth-Data-Items AVPs with a high SIP-Item-Number value.

6.3.15 Server-Assignment-Type AVP

The Server-Assignment-Type AVP is of type Enumerated, and indicates the type of server update being performed in a Server-Assignment-Request operation. The following values are defined:

NO_ASSIGNMENT (0)

This value is used to request from HSS the user profile assigned to one or more public identities, without affecting the registration state of those identities.

REGISTRATION (1)

The request is generated as a consequence of a first registration of an identity.

RE_REGISTRATION (2)

The request corresponds to the re-registration of an identity.

UNREGISTERED_USER (3)

The request is generated because the S-CSCF received an INVITE for a public identity that is not registered.

TIMEOUT_DEREGISTRATION (4)

The SIP registration timer of an identity has expired.

USER_DEREGISTRATION (5)

The S-CSCF has received a user initiated de-registration request.

TIMEOUT_DEREGISTRATION_STORE_SERVER_NAME (6)

The SIP registration timer of an identity has expired. The S-CSCF keeps the user data stored in the S-CSCF and requests HSS to store the S-CSCF name.

USER_DEREGISTRATION_STORE_SERVER_NAME (7)

The S-CSCF has received a user initiated de-registration request. The S-CSCF keeps the user data stored in the S-CSCF and requests HSS to store the S-CSCF name.

ADMINISTRATIVE_DEREGISTRATION (8)

The S-CSCF, due to administrative reasons, has performed the de-registration of an identity.

AUTHENTICATION_FAILURE (9)

The authentication of a user has failed.

AUTHENTICATION_TIMEOUT (10)

The authentication timeout has occurred.

DEREGISTRATION_TOO_MUCH_DATA (11)

The S-CSCF has requested user profile information from the HSS and has received a volume of data higher than it can accept.

6.3.16 Deregistration-Reason AVP

The Deregistration-Reason AVP is of type Grouped, and indicates the reason for a de-registration operation.

AVP format

Deregistration-Reason :: = < AVP Header : 615 10415 >

{ Reason-Code }

[Reason-Info]

* [AVP]

6.3.17 Reason-Code AVP

The Reason-Code AVP is of type Enumerated, and defines the reason for the network initiated de-registration. The following values are defined:

PERMANENT_TERMINATION (0)

NEW_SERVER_ASSIGNED (1)

SERVER_CHANGE (2)

REMOVE_S-CSCF (3)

The detailed behaviour of the S-CSCF is defined in 3GPP TS 29.228 [1].

6.3.18 Reason-Info AVP

The Reason-Info AVP is of type UTF8String, and contains textual information to inform the user about the reason for a de-registration.

6.3.19 Charging-Information AVP

The Charging-Information is of type Grouped, and contains the addresses of the charging functions.

AVP format

Charging-Information :: = < AVP Header : 618 10415 >

[Primary-Event-Charging-Function-Name]

[Secondary-Event-Charging-Function-Name]

[Primary-Charging-Collection-Function-Name]

[Secondary-Charging-Collection-Function-Name]

*[AVP]

6.3.20 Primary-Event-Charging-Function-Name AVP

The Primary-Event-Charging-Function-Name AVP is of type DiameterURI. This AVP contains the address of the Primary Online Charging Function.

6.3.21 Secondary-Event-Charging-Function-Name AVP

The Secondary-Event-Charging-Function-Name AVP is of type DiameterURI. This AVP contains the address of the Secondary Online Charging Function.

6.3.22 Primary-Charging-Collection-Function-Name AVP

The Primary-Charging-Collection-Function-Name AVP is of type DiameterURI. This AVP contains the address of the Primary Charging Data Function.

6.3.23 Secondary-Charging-Collection-Function-Name AVP

The Secondary-Charging-Collection-Function-Name AVP is of type DiameterURI. This AVP contains the address of the Secondary Charging Data Function.

6.3.24 User-Authorization-Type AVP

The User-Authorization-Type AVP is of type Enumerated, and indicates the type of user authorization being performed in a User Authorization operation, i.e. UAR command. The following values are defined:

REGISTRATION (0)

This value is used in case of the initial registration or re-registration. I-CSCF determines this from the Expires field or expires parameter in Contact field in the SIP REGISTER method if it is not equal to zero.

This is the default value.

DE_REGISTRATION (1)

This value is used in case of the de-registration. I-CSCF determines this from the Expires field or expires parameter in Contact field in the SIP REGISTER method if it is equal to zero.

REGISTRATION_AND_CAPABILITIES (2)

This value is used in case of initial registration or re-registration and when the I-CSCF explicitly requests S-CSCF capability information from the HSS. The I-CSCF shall use this value when the user's current S-CSCF, which is stored in the HSS, cannot be contacted and a new S-CSCF needs to be selected

6.3.25 Void

6.3.26 User-Data-Already-Available AVP

The User-Data-Already-Available AVP is of type Enumerated, and indicates to the HSS whether or not the S-CSCF already has the part of the user profile that it needs to serve the user. The following values are defined:

USER_DATA_NOT_AVAILABLE (0)

The S-CSCF does not have the data that it needs to serve the user.

USER_DATA_ALREADY_AVAILABLE (1)

The S-CSCF already has the data that it needs to serve the user.

6.3.27 Confidentiality-Key AVP

The Confidentiality-Key is of type OctetString, and contains the Confidentiality Key (CK).

6.3.28 Integrity-Key AVP

The Integrity-Key is of type OctetString, and contains the Integrity Key (IK).

6.3.29 Supported-Features AVP

The Supported-Features AVP is of type Grouped. If this AVP is present it may inform the destination host about the features that the origin host supports. The Feature-List AVP contains a list of supported features of the origin host. The Vendor-ID AVP and the Feature-List AVP shall together identify which feature list is carried in the Supported-Features AVP.

Where a Supported-Features AVP is used to identify features that have been defined by 3GPP, the Vendor-ID AVP shall contain the vendor ID of 3GPP. Vendors may define proprietary features, but it is strongly recommended that the possibility is used only as the last resort. Where the Supported-Features AVP is used to identify features that have been defined by a vendor other than 3GPP, it shall contain the vendor ID of the specific vendor in question.

If there are multiple feature lists defined by the same vendor, the Feature-List-ID AVP shall differentiate those lists from one another. The destination host shall use the value of the Feature-List-ID AVP to identify the feature list.

AVP format

```
Supported-Features ::=      < AVP header: 628 10415 >
                            { Vendor-ID }
                            { Feature-List-ID }
                            { Feature-List }
                            *[AVP]
```

6.3.30 Feature-List-ID AVP

The Feature-List-ID AVP is of type Unsigned32 and it contains the identity of a feature list.

6.3.31 Feature-List AVP

The Feature-List AVP is of type Unsigned32 and it contains a bit mask indicating the supported features of an application. For the Cx application, the meaning of the bits has been defined in 7.1.1.

6.3.32 Supported-Applications AVP

The Supported-Applications AVP is of type Grouped and it contains the supported application identifiers of a Diameter node.

AVP format

```
Supported-Applications ::=  < AVP header: 631 10415 >
                                *[ Auth-Application-Id ]
```

*[Acct-Application-Id]

*[Vendor-Specific-Application-Id]

*[AVP]

6.3.33 Associated-Identities AVP

The Associated-Identities AVP is of type Grouped and it contains the private user identities associated to an IMS subscription.

AVP format

Associated-Identities ::= < AVP header: 632, 10415 >

*[User-Name]

*[AVP]

6.3.34 SIP-Digest-Authenticate AVP

The SIP-Digest-Authenticate is of type Grouped and it contains a reconstruction of either the SIP WWW-Authenticate or Proxy-Authentication header fields specified in IETF RFC 2617 [13].

AVP format

SIP-Digest-Authenticate ::= < AVP Header: 228.4491 >

[Digest-Realm]

[Digest-Domain]

[Digest-Algorithm]

[Digest-QoP]

*[Digest-Auth-Param]

*[AVP]

6.3.35 Digest-Realm AVP

The Digest-Realm AVP is of type UTF8String and it defines the protection domain for the authentication request, as specified in IETF RFC 3261 [3].

6.3.36 Digest-Domain AVP

The Digest-Domain AVP is of type UTF8String and it allows the UE to be informed of the set of URIs for which the same authentication information may be sent as defined in IETF RFC 2617 [13].

6.3.37 Digest-Algorithm AVP

The Digest-Algorithm AVP is of type UTF8String and it contains the algorithm used to compute the challenge-response. If this AVP is omitted, it is assumed that MD5 is the algorithm used. This AVP corresponds to the algorithm directive defined in IETF RFC 2617 [13].

6.3.38 Digest-QoP AVP

The Digest-QoP AVP is of type UTF8String and it indicates the quality-of-protection. When included, this AVP contains a quoted list of "quality-of-protection" values supported by the HSS. This AVP corresponds to the qop-options directive defined in IETF RFC 2617 [13].

6.3.39 Digest-HA1 AVP

The Digest-HA1 AVP is of type OctetString and it contains the hexadecimal value, pre-calculated at the HSS, of H(A1) as defined in IETF RFC 2617 [13].

6.3.40 Digest-Auth-Param AVP

The Digest-Auth-Param AVP is of type OctetString and it is the mechanism whereby the S-CSCF and HSS can exchange possible extension parameters contained in Digest headers that are not understood by the S-CSCF and for which there are no corresponding stand-alone AVPs.

Unlike the previously listed Digest-* AVPs, the Digest-Auth-Param contains not only the value, but also the parameter name, since it is unknown to the S-CSCF. This AVP corresponds to the "auth-param" parameter defined in Section 3.2.1 of IETF RFC 2617 [13].

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 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 2001-2005 and 5001-5011. See section 6.2.

6.4.3 Command Code values

This specification assigns the values 300-305 from the range allocated by IANA to 3GPP in IETF RFC 3589 [12].

6.4.4 Application-ID value

IANA has allocated the value 16777216 for the 3GPP Cx interface application.

7 Special Requirements

7.1 Version Control

New functionality - i.e. functionality beyond the Rel-5 standard - shall be introduced by post-Rel-5 versions of this specification to the Diameter applications as follows:

1. If possible, the new functionality shall be defined optional.
2. If backwards incompatible changes can not be avoided, the new functionality should be introduced as a feature, see 7.1.1.
3. If the change would be backwards incompatible even as if it was defined as a feature, a new version of the interface shall be created by changing the application identifier of the Diameter application, see 7.1.2.

7.1.1 Defining a new feature

The base functionality for the Cx is the 3GPP Rel-5 standard and a feature is an extension to that functionality. A feature is a functional entity that has a significant meaning to the operation of a Diameter application i.e. a single new parameter without a substantial meaning to the functionality of the Diameter endpoints should not be defined to be a new feature. If the support for a feature is defined mandatory in a post-Rel-5 versions of this specification, the feature concept enables interworking between Diameter endpoints regardless of whether they support all, some or none of the features of the application. Features should be defined so that they are independent from one another.

The content of a feature shall be defined as a part of the specification of the affected application messages. If new AVPs are added to the commands because of the new feature, the new AVPs shall have the 'M' bit cleared and the AVP shall not be defined mandatory in the command ABNF. The support for a feature may be defined to be mandatory behaviour of a node.

The following table of features shall apply to the Cx interface.

Table 7.1.1: Features of Feature-List-ID 1 used in Cx

Feature bit	Feature	M/O	Description
0	SiFC	O	Shared iFC sets This feature is applicable for the SAR/SAA and PPR/PPA command pairs. If both the HSS and the S-CSCF support this feature, subsets of Initial Filter Criteria may be shared by several service profiles and the HSS shall download the shared iFC sets implicitly by downloading the unique identifiers of the shared iFC sets to the S-CSCF. By means of a locally administered database, the S-CSCF then maps the downloaded identifiers onto the shared iFC sets. If the S-CSCF does not support this feature, the HSS shall not download identifiers of shared iFC sets. Instead as a default behavior the HSS shall (by means of a locally administered database) download the iFCs of a shared iFC set explicitly. If the HSS does not support this feature, no special default behaviour is required for the S-CSCF. Note: In using this feature option, the network operator is responsible for keeping the local databases in the S-CSCFs and HSSs consistent.
Feature bit: The order number of the bit within the Supported-Features AVP, e.g. "1". Feature: A short name that can be used to refer to the bit and to the feature, e.g. "MOM". M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O"). Description: A clear textual description of the feature.			

The origin host may discover the supported features of the destination host with the dynamic discovery mechanism defined in 7.2 or via local O&M interfaces.

7.1.2 Changing the version of the interface

The version of an interface shall be changed by a future version of this specification only if there is no technically feasible means to avoid backwards incompatible changes to the Diameter application, i.e. to the current version of the interface. However, if the incompatible changes can be capsulated within a feature, there is no need to change the version of the interface. The versioning of an interface shall be implemented by assigning a new application identifier for the interface. This procedure is in line with the Diameter base protocol (see IETF RFC 3588) which defines that if an incompatible change is made to a Diameter application, a new application identifier shall be assigned for the Diameter application.

The following table shall apply to the Cx interface, column Application identifier lists the used application identifiers on Cx and 3GPP.

Table 7.1.2: Application identifiers used in Cx

Application identifier	First applied
16777216	3GPP Rel-5

The origin host may discover which versions of an interface the destination host supports within the capabilities exchange (i.e. CER/CEA command), via the error messages defined in the chapter 7.3 or via local O&M interfaces.

7.2 Supported features

Features that are not indicated in the Supported-Features AVPs within a given application message shall not be used to construct that message. A request application message shall always be compliant with the list of supported features indicated in the Supported-Features AVPs within the application message. If a feature does not effect on constructing an application message, the message is by definition compliant with the feature. If no features are indicated in the application message, no features - i.e. no extensions to Rel-5 - shall be used to construct the application message. An answer application message shall always indicate in the Supported-Features AVPs the complete set of features supported by the sender of the answer application message. An answer application message shall be compliant with the features commonly supported by the sender of the request and answer application messages.

The sender of a request application message shall discover for a given application message pair which features a destination host supports as described in 7.2.1. The discovery of the supported features shall apply only to the exchanged application message pair type, the discovered features of one command pair shall not be applicable to other command pairs within the application. Different commands within an application may support a different set of features. After discovering the features a destination host supports for a given application message pair, the sender of the request application message may store the information on the supported features of the destination host and it may use the features the destination host supports to construct the subsequent request application messages sent to the destination host.

7.2.1 Dynamic discovery of supported features

When sending a request application message to a destination host whose supported features the sender does not know, the request application message shall include the Supported-Features AVP containing the complete set of features supported by the sender. An exception to this is where the origin host does not use any features to construct the request application message and it is not prepared to accept an answer application message which is constructed by making use of any features. For this exception the origin host need not include the Supported-Features AVP within the message. The Supported-Features AVP within a request application message shall always have the ‘M’ bit set and within an answer application message the AVP shall never have the ‘M’ bit set.

On receiving a request application message, the destination host shall do one of the following:

- If it supports all features indicated in the Supported-Features AVPs within the request message, the answer application message shall include Supported-Features AVPs identifying the complete set of features that it supports. The Experimental-Result-Code AVP shall not be set to DIAMETER_ERROR_FEATURE_UNSUPPORTED.

- If the request application message does not contain any Supported-Features AVPs, the answer application message shall include either Supported-Features AVPs identifying the complete set of features that it supports or, if it does not support any features, no Supported-Features AVPs shall be present. The Experimental-Result-Code AVP shall not be set to DIAMETER_ERROR_FEATURE_UNSUPPORTED.

- If it is a post Rel-5 destination host and it does not support all the features indicated in the Supported-Features AVPs, it shall return the answer application message with the Experimental-Result-Code AVP set to DIAMETER_ERROR_FEATURE_UNSUPPORTED and it shall include also Supported-Features AVPs containing lists of all features that it supports.
- If it is a Rel-5 destination host and it receives a request application message containing Supported-Features AVPs, it will return the answer application message with the Result-Code AVP set to DIAMETER_AVP_UNSUPPORTED and a Failed-AVP AVP containing at least one Supported-Features AVP as received in the request application message.

If an answer application message is received with the Experimental-Result-Code AVP set to DIAMETER_ERROR_FEATURE_UNSUPPORTED or with the Result-Code AVP set to DIAMETER_AVP_UNSUPPORTED, the sender of the request application message may, based on the information in the received Supported-Features AVP or the lack of the AVP in the message, re-send the Diameter message containing only the common supported features.

7.3 Interface versions

The sender of the request application message may discover which versions of an interface a destination host supports together with the capabilities exchange (i.e. CER/CEA command pair) and with error mechanisms defined to the application messages in 7.3.1. The sender of the request application message should store information on all versions of the interface the destination host supports. The sender of the request application message should use the latest common version of the application supported by the destination host to send the request.

If the receiver of the request application message itself or the versions of the interface it supports are not yet known, the sender of the request application message should use the latest supported version of the interface of the Diameter peer (i.e. Diameter proxy, redirect or relay agent) discovered during the capabilities exchange. If the Diameter peer is a redirect or relay agent, which advertises the 0xffffffff as an application identifier, the sender of the request application message shall use its own latest supported version of the interface when initiating the request.

7.3.1 Discovery of supported interface versions

When a Diameter agent receives a request application message and the Diameter agent doesn't find any upstream peer that would support the application identifier indicated in the request, the Diameter agent shall return the result code DIAMETER_UNABLE_TO_DELIVER and it may also return the list of the application identifiers, which are supported by the destination host of the request application message. The supported application identifiers are carried in the answer application message in the Supported-Applications grouped AVP.

Message format for the answer application message (based on the RFC 3588, section 7.2) is as follows:

```
<answer-message> ::= < Diameter Header: code, ERR [PXY] >
                        0*1< Session-Id >
                            { Origin-Host }
                            { Origin-Realm }
                            { Result-Code }
                            [ Origin-State-Id ]
                            [ Error-Reporting-Host ]
                            [ Proxy-Info ]
                            [ Supported-Applications ]
                            * [ AVP ]
```

If the receiver of a request application message does not support the application identifier indicated in the message, it shall return the result code DIAMETER_APPLICATION_UNSUPPORTED and it may also return the list of all

application identifiers it supports. The supported application identifiers are carried in the Supported-Applications grouped AVP. The error message format is as specified above.

If an answer application message is received with Result-Code AVP set to DIAMETER_UNABLE_TO_DELIVER or Experimental-Result-Code AVP set to DIAMETER_APPLICATION_UNSUPPORTED and the message contains the Supported-Applications AVP, the receiver of the answer application message may select, based on the information in the Supported-Applications AVP, the latest common version of the interface with the destination host and re-send the Diameter message with a structure conforming to the ABNF of that release.

Appendix I Change History

Base document for PKT-SP-29.229-I01:
3GPP TS 29.229 V6.7.0 (2005-12) plus cable-specific changes.

Appendix II CableLabs Acknowledgements

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