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Contents

Foreword

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

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1 Scope

The present document describes the Diameter-based PC4a interface between the Proximity Services (ProSe) Function and the Home Subscriber Server (HSS) defined for ProSe services.

This specification defines the Diameter application for PC4a reference point between the ProSe Function and the HSS.The interactions between the ProSe Function and the HSS are specified.

The stage 2 description for Proximity Services (ProSe) features in EPS is specified in 3GPP TS 23.303 [2].

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*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.303: "Proximity based Services; Stage 2".

[3] IETF RFC 3588: "Diameter Base Protocol".

[4] 3GPP TS 33.210: "3G Security; Network Domain Security; IP Network Layer Security".

[5] IETF RFC 4960: "Stream Control Transmission Protocol".

[6] 3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol".

[7] 3GPP TS 23.003: "Numbering, addressing and identification".

[8] IETF RFC 5234: "Augmented BNF for Syntax Specifications: ABNF".

[9] 3GPP TS 29.228: "IP multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and Message Elements".

[10] 3GPP TS 29.272: "Evolved Packet System; MME and SGSN Related Interfaces Based on Diameter Protocol".

[11] 3GPP TS 23.007: "Restoration procedures".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ProSe Proximity-based Services

4 General Description

4.1 Introduction

The PC4a reference point between the ProSe Function and the HSS is defined in the 3GPP TS 23.303 [2].

This document describes the PC4a interface related procedures, message parameters and protocol specifications.

The PC4a interface allows the ProSe Function to retrieve ProSe Discovery related subscription data in order to authorise access from the UE for ProSe Discovery Services.

5 Procedure Descriptions

5.1 Introduction

This section describes the Diameter-based PC4a interface related procedures and information elements exchanged between the ProSe Function and the HSS.

In the tables that describe the Information Elements transported by each Diameter command, each Information Element is marked as (M) Mandatory, (C) Conditional or (O) Optional in the "Cat." column. For the correct handling of the Information Element according to the category type, see the description detailed in section 6 of the 3GPP TS 29.228 [9].

5.2 ProSe Subscriber Information Retrieval

5.2.1 General

This procedure shall be used between the ProSe Function and the HSS for discovery authorization of the UE for the ProSe service. The procedure shall be invoked by the ProSe Function and is used:

- to request ProSe Discovery related subscription data.

This procedure is mapped to the commands ProSe-Subscriber-Information-Request/Answer (PIR/PIA) in the Diameter application specified in clause 6. Tables 5.2.1-1 and 5.2.1-2 detail the involved information elements.

Table 5.2.1-1: ProSe Subscriber Information Retrieval Request

Information Element Name	Mapping to Diameter AVP	Cat.	Description
IMSI	User-Name (See IETF RFC 3588 [3])	M	This information element shall contain the user IMSI, formatted according to 3GPP TS 23.003 [7], clause 2.2.
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

Table 5.2.1-2: ProSe Subscriber Information Retrieval Answer

Information Element Name	Mapping to Diameter AVP	Cat.	Description
Result (See 6)	Result-Code / Experimental-Result	M	This IE shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for PC4a errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. The following errors are applicable: - User Unknown - Unknown ProSe Subscription - ProSe Not Allowed
ProSe Subscription Data (See 6.3.2)	ProSe-Subscription-Data	C	This information element shall contain the ProSe Subscription Data that gives the user permission to use ProSe.
Visited PLMN Id (See 3GPP TS 29.272 [10])	Visited-PLMN-Id	C	This IE shall contain the MCC and the MNC of the PLMN where the UE is registered, see 3GPP TS 23.003 [7]. It shall be present if the UE is roaming in a PLMN different from the Home PLMN.
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

5.2.2 Detailed Behaviour of the ProSe Function

The ProSe Function shall make use of this procedure to request ProSe Discovery related subscription data.

If the ProSe Function retrieved the ProSe Discovery related subscription data, the ProSe Function shall perform the authorisation for discovery as described in the 3GPP TS 23.303 [2].

5.2.3 Detailed Behaviour of the HSS

When receiving a Discovery Authorization Request the HSS shall check if the IMSI for whom data is requested exists in the HSS. If not, an Experimental-Result of DIAMETER_ERROR_USER_UNKNOWN shall be returned.

If the IMSI exists but there is not any ProSe subscription data for the IMSI, the HSS shall return an Experimental-Result of DIAMETER_ERROR_UNKNOWN_PROSE_SUBSCRIPTION.

If the UE is not allowed to use ProSe services in the visited PLMN, the HSS shall return an Experimental-Result of DIAMETER_ERROR_PROSE_NOT_ALLOWED. Otherwise, the HSS shall return a Result-Code of DIAMETER_SUCCESS and download the ProSe subscription data to the ProSe Function. The HSS shall provide the Visited PLMN ID of where the UE is registered if the UE is roaming in a PLMN different from the Home PLMN.

Editor"s Note: It is to be decided if the HSS needs to store the ProSe Function Identity per UE in order to update the ProSe subscription data when modified in the ProSe Function subsequently.

5.3 Update ProSe Subscriber Data

5.3.1 General

The Update ProSe Subscriber Data procedure shall be used between the ProSe Function and the HSS to update the subscriber related data downloaded by means of the ProSe Subscriber Information Retrieval operation (see clause 5.2) and stored in the ProSe Function.

It shall be used to update subscriber related data in the ProSe Function due to administrative changes of the user data in the HSS, i.e. if the user was given a subscription and the subscription has changed. It shall be used at least to perform the following:

- update of all of ProSe subscription data of the subscriber,
- update of a subset of the ProSe subscription data of the subscriber.
- deletion of the ProSe subscription data of the subscriber.

The procedure will also be triggered wenn the VPLMN has changed.

This procedure is mapped to the commands Update-ProSe-Subscriber-Data-Request/Answer (UPR/UPA) in the Diameter application specified in clause 6.

Table 5.3.1-1 specifies the involved information elements for the request.

Table 5.3.1-2 specifies the involved information elements for the answer.

Table 5.3.1-1: Update ProSe Subscriber Data Request

Information element name	Mapping to Diameter AVP	Cat.	Description
IMSI	User-Name (See IETF RFC 3588 [3])	M	This information element shall contain the user IMSI, formatted according to 3GPP TS 23.003 [7], clause 2.2.
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
ProSe Subscription Data (See 6.3.2)	ProSe-Subscription-Data	C	This information element shall contain the ProSe Subscription Data that gives the user permission to use ProSe.
Visited PLMN Id (See 3GPP TS 29.272 [10])	Visited-PLMN-Id	C	This IE shall contain the MCC and the MNC of the PLMN where the UE is registered, see 3GPP TS 23.003 [7]. It shall be present if the UE is roaming in a PLMN different from the Home PLMN.
UPR Flags	UPR-Flags	M	This Information Element shall contain a bit mask. See clause 6.3.6 for the meaning of the bits.

Table 5.3.1-2: Update ProSe Subscriber Data Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
Result (See 6.4)	Result-Code / Experimental-Result	M	This IE shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for PC4a errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. The following errors are applicable in this case: - User Unknown - Unknown ProSe Subscription

5.3.2 Detailed behaviour of the ProSe Function

When receiving a Update ProSe Subscriber Data request, the ProSe Function shall check whether the IMSI is known.

If it is not known, a result code of DIAMETER_ERROR_USER_UNKNOWN shall be returned.

If it is known, the ProSe Function shall update the corresponding data according to the indication as sent in the request, and acknowledge the Update ProSe Subscriber Data message by returning an Update ProSe Subscriber Data Answer. If the UPR-Flags indicates that the ProSe subscription data is to be deleted, the ProSe Function shall delete the associated ProSe UE context if it has been stored before.

If the update of the subscription data succeeds in the ProSe Function, the Result-Code shall be set to DIAMETER_SUCCESS.

If the ProSe Function cannot fulfil the received request for other reasons, e.g. due to a database error, it shall set the Result-Code to DIAMETER_UNABLE_TO_COMPLY. In this case, the ProSe Function shall mark the subscription record "Subscriber data to be restored in the HSS".

5.3.3 Detailed behaviour of the HSS

The HSS shall make use of this procedure to update the relevant subscriber related data in the the ProSe Function to replace a specific part of the user data stored in the ProSe Function with the data sent.

If the ProSe related subscription data is updated or revoked, the HSS sends the updated ProSe subscription data to the ProSe Function. The HSS shall include an UPR-Flags to indicate which part of the data is updated. If all of the ProSe subscription data is to be removed, the HSS shall set the "Removal of all ProSe Subscription Data" bit of the UPR-Flags, and the HSS shall delete the ProSe Function Identity if it is stored for this subscriber.

5.4 Notification Procedure

5.4.1 General

This procedure shall be used between the ProSe Function and the HSS when the HSS needs to be notified about:

- revocation of authorization for ProSe direct service on one PLMN.

This procedure is mapped to the commands ProSe-Notify-Request/Answer (PNR/PNA) in the Diameter application specified in clause 6. Tables 5.4.1-1 and 5.4.1-2 detail the involved information elements.

Table 5.4.1-1: ProSe Notify Request

Information Element Name	Mapping to Diameter AVP	Cat.	Description
IMSI	User-Name (See IETF RFC 3588 [3])	C	This information element shall contain the user IMSI, formatted according to 3GPP TS 23.003 [7], clause 2.2. It shall be present if the revocation is for a specific UE.
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
PLMN ID (see 3GPP TS 29.272 [10])	Visited-PLMN-Id	C	This information element shall contain the MCC and the MNC of the PLMN where the UE"s authorization for ProSe direct service is revoked, see 3GPP TS 23.003 [7]. It shall be present if the ProSe Function revokes the authorization for ProSe direct service in a specific PLMN.
PNR Flags (see 6.3.7)	PNR-Flags	C	This Information Element shall contain a bit mask. See 6.3.7 for the meaning of the bits.

Table 5.4.1-2: ProSe Notify Answer

Information Element Name	Mapping to Diameter AVP	Cat.	Description
Result (See 6)	Result-Code / Experimental-Result	M	This IE shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for PC4a errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. The following errors are applicable: - User Unknown - Unknown ProSe Subscription
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

5.4.2 Detailed Behaviour of the ProSe Function

The ProSe Function shall make use of this procedure to revoke authorization for ProSe direct service.

The ProSe Function shall send the updated ProSe Permission and the PLMN ID for which the ProSe Permission is to be updated. If the revocation is for a single UE in the indicated PLMN, the ProSe Function shall include IMSI in the request.

5.4.3 Detailed Behaviour of the HSS

When receiving a ProSe Notify Request the HSS shall check if the IMSI, if present in the message, exists in the HSS. If not, an Experimental-Result of DIAMETER_ERROR_USER_UNKNOWN shall be returned.

If the IMSI exists but there is not any ProSe subscription data for the IMSI and the PLMN ID as indicated by the Visited-PLMN-Id AVP in the request, the HSS shall return an Experimental-Result of DIAMETER_ERROR_UNKNOWN_PROSE_SUBSCRIPTION.

If the IMSI exists and there is ProSe subscription data for the IMSI and the PLMN ID as indicated by the Visited-PLMN-Id AVP in the request, the HSS shall revoke ProSe direct service as indicated by the PUR-Flags received in the request on that PLMN for the user and update the ProSe Subscription data accordingly. The HSS shall set the result code to DIAMETER_SUCCESS.

If IMSI is not present in the message, the HSS shall check if there are any users subscribed to ProSe subscription for the PLMN as indicated by the Visited-PLMN-Id AVP in the request, and if yes, revoke ProSe direct service as indicated by the PUR-Flags received in the request on that PLMN for all the impacted users and update their ProSe Subscription data accordingly. The HSS shall set the result code to DIAMETER_SUCCESS.

For any other reasons if the HSS cannot fulfil the received request, e.g. due to a database error, it shall set the result code to DIAMETER_UNABLE_TO_COMPLY.

5.5 Reset

5.5.1 General

The Reset Procedure shall be used by the HSS, after a restart, to indicate to the ProSe Function that a failure has occurred.

This procedure is mapped to the commands Reset-Request/Answer (RSR/RSA) in the Diameter application specified in clause 6.

Table 5.5.1-1 specifies the involved information elements for the request.

Table 5.5.1-2 specifies the involved information elements for the answer.

Table 5.5.1-1: Reset Request

Information element name	Mapping to Diameter AVP	Cat.	Description
User Id List (See 3GPP TS 29.272 [10])	User-Id	O	This IE shall contain a list of ProSe User-Ids where a ProSe User-Id comprises the leading digits of an IMSI (i.e. MCC, MNC, leading digits of MSIN) and it shall identify the set of subscribers whose IMSIs begin with the User-Id. The HSS may include this information element if the occurred failure is limited to subscribers identified by one or more User-Ids.
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.

Table 5.5.1-2: Reset Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Supported Features (See 3GPP TS 29.229 [6])	Supported-Features	O	If present, this information element shall contain the list of features supported by the origin host.
Result (See 6.4)	Result-Code / Experimental-Result	M	This IE shall contain the result of the operation. The Result-Code AVP shall be used to indicate success / errors as defined in the Diameter Base Protocol. The Experimental-Result AVP shall be used for PC4a errors. This is a grouped AVP which shall contain the 3GPP Vendor ID in the Vendor-Id AVP, and the error code in the Experimental-Result-Code AVP. There are no Experimental-Result codes applicable for this command.

5.5.2 Detailed behaviour of the ProSe Function

When receiving a Reset message the ProSe Function shall mark all impacted subscriber records "Subscriber DataConfirmed in HSS" as "Not Confirmed", as defined in 3GPP TS 23.007 [11]. The ProSe Function shall make use of the HSS Identity received in the Origin-Host AVP (by comparing it with the value stored after successful PIA) and may make use of the received User-Id-List (if any) in order to determine which subscriber records are impacted.

5.5.3 Detailed behaviour of the HSS

The HSS shall make use of this procedure in order to indicate to all relevant ProSe Functions that the HSS has restarted and may have lost the current ProSe Function Identity of some of its subscribers who may be currently roaming in the ProSe Function Area and that the HSS, therefore, cannot send an Update ProSe Subscriber Data messages when needed.

The HSS may include a list of User Ids identifying a subset of subscribers served by the HSS, if the occurred failure is limited to those subscribers.

6 Protocol Specification and Implementations

6.1 Introduction

6.1.1 Use of Diameter Base Protocol

The Diameter Base Protocol as specified in IETF RFC 3588 [3] shall apply except as modified by the defined support of the methods and the defined support of the commands and AVPs, result and error codes as specified in this

specification. Unless otherwise specified, the procedures (including error handling and unrecognised information handling) shall be used unmodified.

6.1.2 Securing Diameter Messages

For secure transport of Diameter messages, see 3GPP TS 33.210 [4]

6.1.3 Accounting Functionality

Accounting functionality (Accounting Session State Machine, related command codes and AVPs) shall not be used on the PC4a interface.

6.1.4 Use of Sessions

Between the ProSe Function and the HSS, Diameter sessions shall be implicitly terminated. An implicitly terminated session is one for which the server does not maintain state information. The client shall not 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 [3]. As a consequence, the server shall not maintain any state information about this session and the client shall not send any session termination request. Neither the Authorization-Lifetime AVP nor the Session-Timeout AVP shall be present in requests or responses.

6.1.5 Transport Protocol

Diameter messages over the PC4a interface shall make use of SCTP, see IETF RFC 4960 [5].

6.1.6 Routing Considerations

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

The PC4a reference point is defined as an intra-operator interface, and both the ProSe Function and the HSS are located in the home PLMN of the UE that requests ProSe Discovery services. If the ProSe Function 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, the Destination-Realm AVP shall be present and the command shall be routed to the next Diameter node. Consequently, the Destination-Host AVP is declared as optional in the ABNF for all requests initiated by the ProSe Function.

The HSS obtains the Destination-Host AVP to use in requests towards the ProSe Function, from the Origin-Host AVP received in previous requests from the ProSe Function. Consequently, the Destination-Host AVP is declared as mandatory in the ABNF for all requests initiated by the HSS.

If the Vendor-Specific-Application-ID AVP is received in any of the commands, it may be ignored by the receiving node, and it shall not be used for routing purposes.

NOTE: The Vendor-Specific-Application-ID can be included as an optional AVP in all commands in order to ensure interoperability with diameter agents following a strict implementation of IETF RFC 3588 [3], by which messages not including this AVP will be rejected. IETF RFC 3588 [3] indicates that the AVP shall be present in all proxiable commands, such as those defined in this specification, despite the fact that the contents of this AVP are redundant since the Application ID is already present in the command header. This AVP may be removed in subsequent revisions of this specification, once the diameter base protocol is updated accordingly.

6.1.7 Advertising Application Support

The ProSe Function and the HSS shall advertise support of the Diameter PC4a Application by including the value of the application identifier 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 value of 3GPP (10415) 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.

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 IETF RFC 3588 [3].

6.1.8 Diameter Application Identifier

The PC4a interface protocol shall be 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 PC4a interface application is xxxxxx (allocated by IANA).

6.1.9 Use of the Supported-Features AVP

When new functionality is introduced on the PC4a interface, it should be defined as optional. If backwards incompatible changes can not be avoided, the new functionality shall be introduced as a new feature and support advertised with the Supported-Features AVP. The usage of the Supported-Features AVP on the PC4a interface is consistent with the procedures for the dynamic discovery of supported features as defined in clause 7.2 of 3GPP TS 29.229 [6].

When extending the application by adding new AVPs for a feature, the new AVPs shall have the M bit cleared and the AVP shall not be defined mandatory in the command ABNF.

As defined in 3GPP TS 29.229 [6], the Supported-Features AVP is of type grouped and contains the Vendor-Id, Feature-List-ID and Feature-List AVPs. On the all reference points as specified in this specification, the Supported-Features AVP is used to identify features that have been defined by 3GPP and hence, for features defined in this document, the Vendor-Id AVP shall contain the vendor ID of 3GPP (10415). If there are multiple feature lists defined for the reference point, the Feature-List-ID AVP shall differentiate those lists from one another.

6.2 Commands

6.2.1 Introduction

This section defines the Command code values and related ABNF for each command described in this specification.

6.2.2 Command-Code Values

This section defines Command-Code values for the PC4a interface application as allocated by IANA.

Every command is defined by means of the ABNF syntax IETF RFC 5234 [8], according to the rules in IETF RFC 3588 [3]. In the case, the definition and use of an AVP is not specified in this document, the guidelines in IETF RFC 3588 [3] shall apply.

The following Command Codes are defined in this specification:

Table 6.2.2-1: Command-Code values for PC4a

Command-Name	Abbreviation	Code	Section
ProSe-Subscriber-Information-Request	PIR	xxx	6.2.3
ProSe-Subscriber-Information-Answer	PIA	xxx	6.2.4
Update-ProSe-Subscriber-Data-Request	UPR	xxx	6.2.5
Update-ProSe-Subscriber-Data-Answer	UPA	xxx	6.2.6
ProSe-Notify-Request	PNR	xxx	6.2.7
ProSe-Notify-Answer	PNA	xxx	6.2.8
Reset-Request	RSR	322	6.2.9
Reset-Answer	RSA	322	6.2.10

For these commands, the Application-ID field shall be set to xxxxxx (application identifier of the PC4a interface application, allocated by IANA).

6.2.3 ProSe-Subscriber-Information-Request (PIR) Command

The ProSe-Subscriber-Information-Request (PIR) command, indicated by the Command-Code field set to xxx and the "R" bit set in the Command Flags field, is sent from the ProSe Function to the HSS.

Message Format

```
< ProSe-Subscriber-Information-Request > ::=    < Diameter Header: xxx, REQ, PXY, xxxxxx >
                                                < Session-Id >
                                                [ Vendor-Specific-Application-Id ]
                                                { Auth-Session-State }
                                                { Origin-Host }
                                                { Origin-Realm }
                                                [ Destination-Host ]
                                                { Destination-Realm }
                                                { User-Name }
                                                *[ Supported-Features ]
                                                *[ AVP ]
                                                *[ Proxy-Info ]
                                                *[ Route-Record ]
```

6.2.4 ProSe-Subscriber-Information-Answer (PIA) Command

The ProSe-Subscriber-Information-Answer (PIA) command, indicated by the Command-Code field set to xxx and the "R" bit cleared in the Command Flags field, is sent from the HSS to the ProSe Function.

Message Format

```
< ProSe-Subscriber-Information-Answer > ::=    < Diameter Header: xxx, PXY, xxxxxx >
                                               < Session-Id >
                                               [ Vendor-Specific-Application-Id ]
                                               [ Result-Code ]
                                               [ Experimental-Result ]
                                               { Auth-Session-State }
                                               { Origin-Host }
                                               { Origin-Realm }
                                               [ ProSe-Subscription-Data ]
                                               [ Visited-PLMN-Id ]
                                               *[ Supported-Features ]
                                               *[ AVP ]
                                               *[ Failed-AVP ]
                                               *[ Proxy-Info ]
                                               *[ Route-Record ]
```

6.2.5 Update-ProSe-Subscriber-Data-Request (UPR) Command

The Update-ProSe Subscriber Data-Request (UPR) command, indicated by the Command-Code field set to xxx and the 'R' bit set in the Command Flags field, is sent from the HSS to the ProSe Function.

Message Format when used over the PC4a application:

```
< Update-ProSe-Subscriber-Data-Request > ::=  < Diameter Header: xxx, REQ, PXY, xxxxxx>
                                              < Session-Id >
                                              [ Vendor-Specific-Application-Id ]
                                              { Auth-Session-State }
                                              { Origin-Host }
                                              { Origin-Realm }
                                              { Destination-Host }
                                              { Destination-Realm }
                                              { User-Name }
                                              *[ Supported-Features ]
                                              [ ProSe Subscription-Data ]
                                              [ Visited-PLMN-Id ]
                                              { UPR-Flags }
                                              *[ AVP ]
                                              *[ Proxy-Info ]
                                              *[ Route-Record ]
```

6.2.6 Update-ProSe-Subscriber-Data-Answer (UPA) Command

The Update-ProSe Subscriber Data-Answer (UPA) command, indicated by the Command-Code field set to xxx and the 'R' bit cleared in the Command Flags field, is sent from the ProSe Function to the HSS.

Message Format when used over the PC4a application:

```
< Update-ProSe-Subscriber-Data-Answer> ::=  < Diameter Header: xxx, PXY, xxxxxx >
                                            < Session-Id >
                                            [ Vendor-Specific-Application-Id ]
                                            *[ Supported-Features ]
                                            [ Result-Code ]
                                            [ Experimental-Result ]
                                            { Auth-Session-State }
                                            { Origin-Host }
                                            { Origin-Realm }
                                            *[ AVP ]
                                            *[ Failed-AVP ]
                                            *[ Proxy-Info ]
                                            *[ Route-Record ]
```

6.2.7 ProSe-Notify-Request (PNR) Command

The ProSe-Notify-Request (PNR) command, indicated by the Command-Code field set to xxx and the "R" bit set in the Command Flags field, is sent from the ProSe Function to the HSS.

Message Format

```
< ProSe-Notify-Request > ::=  < Diameter Header: xxx, REQ, PXY, xxxxxx >
                              < Session-Id >
                              [ Vendor-Specific-Application-Id ]
                              { Auth-Session-State }
                              { Origin-Host }
                              { Origin-Realm }
                              [ Destination-Host ]
                              { Destination-Realm }
                              [ User-Name ]
                              [ ProSe-Permission ]
```

[Visited-PLMN-Id]
[PNR-Flags]
*[Supported-Features]
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.2.8 ProSe-Notify-Answer (PNA) Command

The ProSe-Notify-Answer (PNA) command, indicated by the Command-Code field set to xxx and the "R" bit cleared in the Command Flags field, is sent from the HSS to the ProSe Function.

Message Format

< ProSe-Notify-Answer > ::= < Diameter Header: xxx, PXY, xxxxxx >
< 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]

6.2.9 Reset-Request (RSR) Command

The Reset-Request (RSR) command, indicated by the Command-Code field set to 322 and the 'R' bit set in the Command Flags field, is sent from HSS to the ProSe Function.

Message Format when used over the PC4a application:

< Reset-Request> ::= < Diameter Header: 322, REQ, PXY, xxxxxx >
< Session-Id >
[Vendor-Specific-Application-Id]
{ Origin-Host }
{ Origin-Realm }
{ Destination-Host }
{ Destination-Realm }
*[Supported-Features]
*[User-Id]
*[AVP]
*[Proxy-Info]
*[Route-Record]

6.2.10 Reset-Answer (RSA) Command

The Reset-Answer (RSA) command, indicated by the Command-Code field set to 322 and the 'R' bit cleared in the Command Flags field, is sent from ProSe Function to HSS.

Message Format when used over the PC4a application:

< Reset-Answer> ::= < Diameter Header: 322, PXY, xxxxxx >
< Session-Id >
[Vendor-Specific-Application-Id]
*[Supported-Features]
[Result-Code]
[Experimental-Result]

{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
*[AVP]
*[Failed-AVP]
*[Proxy-Info]
*[Route-Record]

6.3 AVPs

6.3.1 General

The following table specifies the Diameter AVPs defined for the PC4a 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 this specification shall be set to 3GPP (10415).

Table 6.3.1-1: PC4a specific Diameter AVPs

				AVP Flag rules				
Attribute Name	**AVP Code**	**Section defined**	**Value Type**	**Must**	**May**	**Should not**	**Must not**	**May Encr.**
ProSe-Subscription-Data	xxx	6.3.2	Group	M, V				No
ProSe-Permission	xxx	6.3.3	Unsigned32	M, V				No
PLMN-Allowed-ProSe	xxx	6.3.4	Group	M, V				No
ProSe-Direct-Allowed	xxx	6.3.5	Unsigned32	M, V				No
UPR-Flags	xxx	6.3.6	Unsigned32	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 [3].								
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.								

The following table specifies the Diameter AVPs re-used by the PC4a interface protocol from existing Diameter Applications, including a reference to their respective specifications and when needed, a short description of their use within PC4a.

Any other AVPs from existing Diameter Applications, except for the AVPs from Diameter Base Protocol, do not need to be supported. The AVPs from Diameter Base Protocol are not included in table 6.3.1-2, but they may be re-used for the PC4a protocol.

Table 6.3.1-2: PC4a re-used Diameter AVPs

Attribute Name	Reference	Comments	M-bit
Visited-PLMN-Id	3GPP TS 29.272 [10]		
Supported-Features	3GPP TS 29.229 [6]		
Feature-List-ID	3GPP TS 29.229 [6]		
Feature-List	3GPP TS 29.229 [6]		
User-Id	3GPP TS 29.272 [10]		
NOTE 1: The M-bit settings for re-used AVPs override those of the defining specifications that are referenced. Values include: "Must set", "Must not set". If the M-bit setting is blank, then the defining specification applies.			
NOTE 2: If the M-bit is set for an AVP and the receiver does not understand the AVP, it shall return a rejection. If the M-bit is not set for an AVP, the receiver shall not return a rejection, whether or not it understands the AVP. If the receiver understands the AVP but the M-bit value does not match with the definition in this table, the receiver shall ignore the M-bit.			

6.3.2 ProSe-Subscription-Data

The ProSe-Subscription-Data AVP is of type Group. It shall contain the ProSe Discovery related subscription data.

AVP format

ProSe-Subscription-Data ::= <AVP header: xxx 10415>

{ ProSe-Permission }

*[PLMN-Allowed-Discovery]

*[AVP]

6.3.3 ProSe-Permission

The ProSe-Permission AVP is of type Unsigned32 and it shall contain a bit mask that indicates the permissions for ProSe subscribed by the user. The meaning of the bits shall be as defined in table 6.3.3/1:

Table 6.3.3-1: ProSe-Permission

Bit	Name	Description
0	ProSe Direct Discovery	This bit, when set, indicates that the user is allowed to use ProSe Direct Discovery.
1	EPC-level ProSe Discovery	This bit, when set, indicates that the user is allowed to use EPC-level ProSe Discovery.
2	EPC support WLAN Direct Discovery and Communication	This bit, when set, indicates that the user is allowed to use EPC support WLAN Direct Discovery and Communication.
3	one-to-many ProSe Direct Communication	This bit, when set, indicates that the user is allowed to use one-to-many ProSe Direct Communication.
NOTE: Bits not defined in this table shall be cleared by the HSS and discarded by the receiving ProSe Function.		

6.3.4 PLMN-Allowed-ProSe

The PLMN-Allowed-ProSe AVP is of type Group. It shall contain the PLMN where the UE is authorised to announce or monitor or both for ProSe Discovery or to use ProSe direct communication.

AVP format

PLMN-Allowed-ProSe ::= <AVP header: xxx 10415>

[Visited-PLMN-Id]

[ProSe-Direct-Allowed]

*[AVP]

6.3.5 ProSe-Direct-Allowed

The ProSe-Direct-Allowed AVP is of type Unsigned32 and it shall contain a bit mask that indicates if the UE is authorised to announce or monitor or both for ProSe Discovery in a specific PLMN. The meaning of the bits shall be as defined in table 6.3.5/1:

Table 6.3.5-1: ProSe-Direct-Allowed

Bit	Name	Description
0	Announce	This bit, when set, indicates that the user is allowed to announce in the corresponding PLMN for ProSe Discovery.
1	Monitor	This bit, when set, indicates that the user is allowed to monitor in the corresponding PLMN for ProSe Discovery.
2	Communication	This bit, when set, indicates that the user is allowed for ProSe direct communication in the corresponding PLMN.
NOTE:	Bits not defined in this table shall be cleared by the HSS and discarded by the receiving ProSe Function.	

6.3.6 UPR-Flags

The UPR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits is defined in table 6.3.6-1:

Table 6.3.6-1: UPR-Flags

Bit	Name	Description
0	Update	This bit, when set, indicates that the ProSe subscriber related data are updated.
1	Removal	This bit, when set, indicates that all of the ProSe subscriber related data are removed.
NOTE:	Bits not defined in this table shall be cleared by the sending HSS and discarded by the receiving ProSe Function.	

6.3.7 PNR-Flags

The PNR-Flags AVP is of type Unsigned32 and it shall contain a bit mask. The meaning of the bits shall be as defined in table 6.3.7-1:

Table 6.3.7-1: PNR-Flags

bit	name	Description
0	Direct Discovery Revoked	This bit, when set, shall indicate to the HSS that the authorization for ProSe direct discovery is to be revoked on the indicated PLMN.
1	Direct Communication Revoked	This bit, when set, shall indicate to the HSS that the authorization for ProSe direct communication is to be revoked on the indicated PLMN.
NOTE:	Bits not defined in this table shall be cleared by the sending ProSe Function and discarded by the receiving HSS.	

6.4 Result-Code AVP and Experimental-Result AVP Values

6.4.1 General

This section defines result code values that shall be supported by all Diameter implementations that conform to this specification.

6.4.2 Success

Result codes that fall within the Success category shall be used to inform a peer that a request has been successfully completed. The Result-Code AVP values defined in Diameter Base Protocol IETF RFC 3588 [3] shall be applied.

6.4.3 Permanent Failures

6.4.3.1 General

Errors that fall within the Permanent Failures category shall be used to inform the peer that the request has failed, and should not be attempted again. The Result-Code AVP values defined in Diameter Base Protocol IETF RFC 3588 [3] shall be applied. When one of the result codes defined here is included in a response, it shall be inside an Experimental-Result AVP and the Result-Code AVP shall be absent.

6.4.3.2 DIAMETER_ERROR_USER_UNKNOWN (5001)

This result code shall be sent by the HSS to indicate that the user identified by the IMSI is unknown. This error code is defined in 3GPP TS 29.229 [6].

6.4.3.3 DIAMETER_ERROR_UNKNOWN_PROSE_SUBSCRIPTION (xxxx)

This result code shall be sent by the HSS to indicate that no ProSe subscription is associated with the IMSI.

6.4.3.4 DIAMETER_ERROR_ PROSE_NOT_ALLOWED (xxxx)

This result code shall be sent by the HSS to indicate that ProSe Services are not allowed to be used in the specific PLMN where the UE is registered.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2014-04	CT4#64bis				Implementation of C4-140706, C4-140707	0.0.1	0.1.0
2014-05	CT4#65	C4-141169			Implementation of C4-140917, C4-141072, C4-141159, C4-141077	0.1.0	0.2.0
2014-07	CT4#66	C4-141668			Implementation of C4-141504, C4-141507, C4-141510, C4-141636	0.2.0	0.3.0
2014-09	CT#65	CP-140497			Presented for information and approval	0.3.0	1.0.0
2014-09	CT#65				Approved at CT#65	1.0.0	12.0.0

History

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