

ETSI TS 129 345 V14.4.0 (2019-10)



**Universal Mobile Telecommunications System (UMTS);
LTE;
Inter-Proximity-services (ProSe) function signalling aspects;
Stage 3
(3GPP TS 29.345 version 14.4.0 Release 14)**



ReferenceRTS/TSGC-0429345ve40

Keywords

LTE,UMTS

ETSI

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Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	7
1 Scope	8
2 References	8
3 Definitions, symbols and abbreviations	9
3.1 Definitions	9
3.2 Abbreviations	9
4 General Description.....	10
4.1 Introduction	10
5 Procedures Description.....	10
5.1 introduction	10
5.2 ProSe Service Authorization	10
5.2.1 General.....	10
5.2.2 Detailed behaviour of the ProSe Function in the HPLMN	11
5.2.3 Detailed behaviour of the ProSe Function in the Local PLMN or VPLMN	12
5.3 ProSe Direct Discovery Authorization.....	12
5.3.1 General.....	12
5.3.2 Detailed behaviour of the HPLMN ProSe Function	13
5.3.3 Detailed behaviour of the ProSe Function in the Local PLMN or VPLMN	15
5.4 ProSe Match Report	17
5.4.1 General.....	17
5.4.2 Detailed behaviour of the HPLMN ProSe Function	18
5.4.3 Detailed behaviour of the ProSe Function in the local PLMN	18
5.5 ProSe Match Report info	19
5.5.1 General.....	19
5.5.2 Detailed behaviour of the requesting ProSe Function.....	20
5.5.3 Detailed behaviour of the receiving ProSe Function	20
5.6 ProSe Proximity Request.....	21
5.6.1 General.....	21
5.6.2 Detailed behaviour of the ProSe Function of the requesting UE	22
5.6.3 Detailed behaviour of the ProSe Function of the targeted UE	22
5.7 ProSe Location Update.....	23
5.7.1 General.....	23
5.7.2 Detailed behaviour of the ProSe Function of the requesting UE	24
5.7.3 Detailed behaviour of the ProSe Function of the targeted UE	24
5.8 ProSe Cancellation	24
5.8.1 General.....	24
5.8.2 Detailed behaviour of the ProSe Function of the requesting UE	25
5.8.3 Detailed behaviour of the ProSe Function of the targeted UE	25
5.9 ProSe Proximity Alert	25
5.9.1 General.....	25
5.9.2 Detailed behaviour of the ProSe Function of the targeted UE	26
5.9.3 Detailed behaviour of the ProSe Function of the requesting UE	26
5.10 ProSe Direct Discovery Authorization Update.....	27
5.10.1 General.....	27
5.10.2 Detailed behaviour of the HPLMN ProSe Function	28
5.10.3 Detailed behaviour of the ProSe Function in the local PLMN or VPLMN	28
5.11 ProSe Direct Discovery Authorization Update Result	28
5.11.1 General.....	28
5.11.2 Detailed behaviour of the ProSe Function in the local PLMN	29
5.11.3 Detailed behaviour of the HPLMN ProSe Function	29

6	Protocol Specification and Implementation	30
6.1	Introduction	30
6.1.1	Use of Diameter base protocol.....	30
6.1.2	Securing Diameter Messages.....	30
6.1.3	Accounting functionality	30
6.1.4	Use of sessions.....	30
6.1.5	Transport protocol	30
6.1.6	Routing considerations	30
6.1.7	Advertising Application Support	31
6.1.8	Diameter Application Identifier.....	31
6.1.9	Use of the Supported-Features AVP	31
6.2	Commands.....	31
6.2.1	Introduction.....	31
6.2.2	Command-Code values	32
6.2.3	ProSe-Authorization-Request (PAR) Command	32
6.2.4	ProSe-Authorization-Answer (PAA) Command.....	33
6.2.5	ProSe-Discovery-Request (PDR) Command	33
6.2.6	ProSe-Discovery-Answer (PDA) Command	34
6.2.7	ProSe-Match-Request (PMR) Command.....	34
6.2.8	ProSe-Match-Answer (PMA) Command.....	34
6.2.9	ProSe-Match-Report-Info-Request (PIR) Command.....	35
6.2.10	ProSe-Match-Report-Info-Answer (PIA) Command	35
6.2.11	ProSe-Proximity-Request (PRR) Command.....	36
6.2.12	ProSe-Proximity-Answer (PRA) Command.....	36
6.2.13	ProSe-Location-Update-Request (PLR) Command	37
6.2.14	ProSe-Location-Update-Answer (PLA) Command	37
6.2.15	ProSe-Alert-Request (ALR) Command.....	38
6.2.16	ProSe-Alert-Answer (ALA) Command.....	38
6.2.17	ProSe-Cancellation-Request (PCR) Command.....	38
6.2.18	ProSe-Cancellation-Answer (PCA) Command.....	39
6.3	Information Elements	39
6.3.1	General.....	39
6.3.2	App-Layer-User-Id	43
6.3.3	Assistance-info	43
6.3.4	Assistance-Info-Validity-Timer	44
6.3.5	Discovery-Type	44
6.3.6	EAP-Master-Session-Key	44
6.3.7	Feature-List-ID AVP	45
6.3.8	Feature-List AVP	45
6.3.9	Filter-Id.....	45
6.3.10	Location-Estimate.....	45
6.3.11	MAC-Address	45
6.3.12	Match-Report.....	45
6.3.13	MSISDN	46
6.3.14	Operating-Channel.....	46
6.3.15	P2P-Features	46
6.3.16	ProSe-App-Code.....	46
6.3.17	ProSe-App-Id.....	46
6.3.18	ProSe-App-Mask	46
6.3.19	ProSe-Direct-Allowed	46
6.3.20	ProSe-Discovery-Filter	46
6.3.21	PRR-Flags.....	47
6.3.22	ProSe-Validity-Timer	47
6.3.23	Requesting-EPUIID	47
6.3.24	Supported-Features	47
6.3.25	SSID.....	47
6.3.26	Targeted-EPUIID.....	47
6.3.27	Time-Window	47
6.3.28	User-Identifier.....	47
6.3.29	Visited-PLMN-Id.....	48
6.3.30	WiFi-P2P-Assistance-Info	48
6.3.31	WLAN-Assistance-Info	48

6.3.32	WLAN-Link-Layer-Id	48
6.3.33	WLAN-Link-Layer-Id-List.....	48
6.3.34	OC-Supported-Features	49
6.3.35	OC-OLR	49
6.3.36	Validity-Time-Announce	49
6.3.37	Validity-Time-Monitor	49
6.3.38	Validity-Time-Communication.....	49
6.3.39	ProSe-App-Code-Info	49
6.3.40	MIC.....	49
6.3.41	UTC-based-Counter	49
6.3.42	Location-Update-Trigger	50
6.3.43	Location-Update-Event-Type	50
6.3.44	Change-Of-Area-Type	50
6.3.45	Location-Update-Event-Trigger	51
6.3.46	Report-Cardinality	51
6.3.47	Minimum-Interval-Time	51
6.3.48	Periodic-Location-Type	51
6.3.49	Location-Report-Interval-Time.....	51
6.3.50	Total-Number-Of-Reports	52
6.3.51	Authorized-Discovery-Range	52
6.3.52	ProSe-Match-Refresh-Timer.....	52
6.3.53	Discovery-Auth-Request	52
6.3.54	Discovery-Auth-Response	53
6.3.55	Match-Request	54
6.3.56	Match-Report-Info	54
6.3.57	PMR-Flags	55
6.3.58	ProSe-Application-Metadata.....	55
6.3.59	Discovery-Entry-ID	55
6.3.60	ProSe-Metadata-Index-Mask	55
6.3.61	App-Identifier	55
6.3.62	OS-ID.....	55
6.3.63	OS-App-ID	55
6.3.64	Requesting-RPAUID	55
6.3.65	Target-RPAUID	56
6.3.66	Target-PDUID	56
6.3.67	ProSe-Restricted-Code.....	56
6.3.68	ProSe-Restricted-Code-Suffix-Range.....	56
6.3.69	Beginning-Suffix	56
6.3.70	Ending-Suffix	56
6.3.71	Match-Timestamp	56
6.3.72	DRMP	56
6.3.73	Banned-RPAUID	57
6.3.74	Banned-PDUID.....	57
6.3.75	Code-Receiving-Security-Material	57
6.3.76	Code-Sending-Security-Material	57
6.3.77	DUSK	57
6.3.78	DUIK	58
6.3.79	DUCK	58
6.3.80	MIC-Check-Indicator.....	58
6.3.81	Encrypted-Bitmask	58
6.3.82	ProSe-App-Code-Suffix-Range	58
6.3.83	Load	58
6.4	Result-Code and Experimental-Result Values	58
6.4.1	General.....	58
6.4.2	Success.....	59
6.4.3	Permanent Failures	59
6.4.3.1	DIAMETER_ERROR_USER_UNKNOWN (5001)	59
6.4.3.2	DIAMETER_ERROR_UNAUTHORIZED_SERVICE (5511)	59
6.4.3.3	DIAMETER_ERROR_NO_ASSOCIATED_DISCOVERY_FILTER (5630).....	59
6.4.3.4	DIAMETER_ERROR_ANNOUNCING_UNAUTHORIZED_IN_PLMN (5631).....	59
6.4.3.5	DIAMETER_ERROR_INVALID_APPLICATION_CODE (5632).....	59
6.4.3.6	DIAMETER_ERROR_PROXIMITY_UNAUTHORIZED (5633).....	59

6.4.3.7	DIAMETER_ERROR_PROXIMITY_REJECTED (5634).....	59
6.4.3.8	DIAMETER_ERROR_NO_PROXIMITY_REQUEST (5635).....	59
6.4.3.9	DIAMETER_ERROR_UNAUTHORIZED_SERVICE_IN_THIS_PLMN (5636)	59
6.4.3.10	DIAMETER_ERROR_PROXIMITY_CANCELLED (5637).....	60
6.4.3.11	DIAMETER_ERROR_INVALID_DISCOVERY_TYPE (5641)	60
6.4.3.12	DIAMETER_ERROR_INVALID_TARGET_PDUID (5638).....	60
6.4.3.13	DIAMETER_ERROR_INVALID_TARGET_RPAUID (5639)	60
6.4.3.14	DIAMETER_ERROR_NO_ASSOCIATED_RESTRICTED_CODE (5640).....	60
6.4.3.15	DIAMETER_ERROR_REVOCATION_FAILURE (56x1).....	60
6.4.3.16	DIAMETER_ERROR_ALREADY_BANNED (56x2).....	60
6.4.4	Transient Failures	60
Annex A (normative):	Diameter overload control mechanism	61
A.1	General	61
A.2	Responding ProSe Function behaviour	61
A.3	Requesting ProSe Function behaviour	61
Annex B (Informative):	Diameter overload node behaviour	62
B.1	Message prioritization	62
Annex C (normative):	Diameter message priority mechanism.....	63
C.1	General	63
C.2	PC6/PC7 interfaces.....	63
C.2.1	General.....	63
C.2.2	ProSe Function behaviour.....	63
Annex D (normative):	Diameter load control mechanism.....	64
D.1	General	64
D.2	Responding ProSe Function behaviour	64
D.3	Requesting ProSe Function behaviour	64
Annex E (informative):	Change history.....	65
History		67

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1 Scope

The present document describes the Diameter-based interfaces between the Proximity Services (ProSe) Function in the HPLMN and the ProSe Function in a local PLMN (PC6 interface) or between the Proximity Services (ProSe) Function in the HPLMN and the ProSe Function in a visited PLMN (PC7 interface).

This specification defines the Diameter application for PC6/PC7 reference points between the ProSe Functions. The interactions between the ProSe Functions 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 (ProSe); Stage 2".
- [3] 3GPP TS 29.228: "IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents".
- [4] 3GPP TS 23.003: "Numbering, addressing and identification".
- [5] 3GPP TS 29.329: "Sh interface based on the Diameter protocol; Protocol details".
- [6] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [7] Void.
- [8] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".
- [9] IETF RFC 4960: "Stream Control Transport Protocol".
- [10] 3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol; protocol details".
- [11] IETF RFC 5234: "Augmented BNF for Syntax Specifications: ABNF".
- [12] IETF RFC 4072: "Diameter Extensible Authentication Protocol (EAP) Application".
- [13] 3GPP TS 32.299: "Charging management; Diameter charging applications".
- [14] 3GPP TS 29.344: "Proximity-services (ProSe) Function to Home Subscriber Server (HSS) aspects (PC4); Stage 3".
- [15] 3GPP TS 29.273: "Evolved Packet System (EPS); 3GPP EPS AAA interfaces".
- [16] 3GPP TS 29.272: "Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".
- [17] Wi-Fi Alliance Technical Committee P2P Task Group, "Wi-Fi Peer-to-Peer (P2P) Technical Specification", Version 1.1.

- [18] 3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications".
- [19] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
- [20] IEEE Std 802.11-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".
- [21] IETF RFC 7683: "Diameter Overload Indication Conveyance".
- [22] 3GPP TS 24.334: "Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects; Stage 3".
- [23] 3GPP TS 33.303: "Proximity-based Services (ProSe); Security aspects".
- [24] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".
- [25] Open Mobile Alliance, OMA AD SUPL: "Secure User Plane Location Architecture", (<http://www.openmobilealliance.org>).
- [26] 3GPP TS 24.333: "Proximity-services (ProSe) Management Objects (MO)".
- [27] IETF RFC 7944: "Diameter Routing Message Priority".
- [28] IETF RFC 8583: "Diameter Load Information Conveyance".
- [29] IETF RFC 6733: "Diameter Base Protocol".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.303 [2] apply:

Local PLMN

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].

ALUID	Application Layer User ID
DRMP	Diameter Routing Message Priority
DSCP	Differentiated Services Code Point
DUCK	Discovery User Confidentiality Key
DUIK	Discovery User Integrity Key
DUSK	Discovery User Scrambling Key
EPUID	EPC ProSe User ID
MIC	Message Integrity Check
PDUID	ProSe Discovery UE ID
ProSe	Proximity-based Services
RPAUID	Restricted ProSe Application User ID
UTC	Universal Time Coordinated
WLLID	WLAN Link Layer ID

4 General Description

4.1 Introduction

The PC6 reference point is defined between a ProSe Function in the HPLMN and a ProSe Function in a local PLMN.

The PC7 reference point is defined between ProSe Function in the HPLMN and a ProSe Function in a visited PLMN.

The definition of the PC6/PC7 reference points and related functionalities are given in 3GPP TS 23.303 [2].

As defined in 3GPP TS 23.303 [2], the PC6/PC7 reference points are used for:

- HPLMN control of service authorization for ProSe;
- Authorization of ProSe Direct Discovery requests;
- Retrieval of Discovery Filter(s) corresponding ProSe Application ID name(s);
- Translation of ProSe Application Code(s) to the associated ProSe Application Name.

5 Procedures Description

5.1 introduction

This clause describes the Diameter-based PC6 and PC7 interfaces related procedures and Information elements exchanged between functional entities.

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 clause 6 of the 3GPP TS 29.228 [3].

5.2 ProSe Service Authorization

5.2.1 General

The ProSe Service Authorization Procedure shall be used between the ProSe Function in the HPLMN and the ProSe Function in Local PLMN or VPLMN to obtain service authorization information for ProSe Direct Discovery, ProSe Direct Communication or both. The procedure shall be invoked by the ProSe Function in the HPLMN by the UE and is used:

- to request service authorization information for ProSe related to the UE from the ProSe Function in the local PLMN or VPLMN;
- to provide the ProSe Function in the local PLMN or VPLMN with the UE identity (IMSI or MSISDN) in order to allow to perform charging;

This procedure is mapped to the commands ProSe-Authorization-Request/Answer (PAR/PAA) in the Diameter application specified in clause 6.

Table 5.2.1-1 specifies the involved information elements for the request.

Table 5.2.1-2 specifies the involved information elements for the answer.

Table 5.2.1-1: ProSe Service Authorization Request

Information element name	Mapping to Diameter AVP	Cat.	Description
UE Identity (See 6.3.28)	User-Identifier	M	This information element shall contain either the user IMSI, formatted according to 3GPP TS 23.003 [4], clause 2.2, or the user MSISDN, formatted according to 3GPP TS 29.329 [5].
PLMN Id (See 6.3.29)	Visited-PLMN-Id	M	This IE shall contain the PLMN-Id (3GPP TS 23.003 [4]) of the network in which the ProSe Function is located.
Supported Features (See 6.3.24)	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 Service Authorization Answer

Information element name	Mapping to Diameter AVP	Cat.	Description
Supported Features (See 6.3.24)	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 PC6/PC7 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 - Unauthorized Service - Unauthorized Service in this PLMN
ProSe Direct Allowed (See 6.3.42)	ProSe-Direct-Allowed	C	This Information Element shall contain the ProSe authorization information of the user. It shall be present if success is reported.
Validity Time of Announcing (see.6.3.36)	Validity-Time-Announce	C	This Information Element shall contain the validity time for a UE authorization to perform ProSe direct discovery announcing in this PLMN. It shall be present if success is reported.
Validity Time of Monitoring (see.6.3.37)	Validity-Time-Monitor	C	This Information Element shall contain the validity time for a UE authorization to perform ProSe direct discovery monitoring in this PLMN. It shall be present if success is reported.
Validity Time of Communication (see.6.3.38)	Validity-Time-Communication	C	This Information Element shall contain the validity time for a UE authorization to perform ProSe direct communication in this PLMN. It shall be present if success is reported.
Authorized Discovery Range (See 3GPP TS 29.344 [14])	Authorized-Discovery-Range	C	This information element shall contain the authorised range (short/medium/long) at which the UE is allowed to announce in the given PLMN according to the defined announcing authorisation policy for this UE. It shall be present if the discovery authorization type is for announcing. Otherwise it shall be absent.

5.2.2 Detailed behaviour of the ProSe Function in the HPLMN

The ProSe Function in the HPLMN shall make use of this procedure to request service authorization information for ProSe related to the UE from the ProSe Function in local PLMN or VPLMN. The ProSe Function shall include in the request the UE identity (IMSI or MSISDN) and the PLMN-Id identifying the PLMN of the requesting ProSe Function.

When receiving a ProSe Service Authorization response from the ProSe Function in the local PLMN or VPLMN, the ProSe Function in the HPLMN shall check the result code. If it indicates SUCCESS, the ProSe Function shall merge with its own policy.

5.2.3 Detailed behaviour of the ProSe Function in the Local PLMN or VPLMN

When receiving a ProSe Service Authorization request, the ProSe Function in the local PLMN or VPLMN shall, in the following order:

1. Check whether the UE Identity (IMSI or MSISDN) exists. If not, a Result Code of `DIAMETER_ERROR_USER_UNKNOWN` shall be returned.
2. Check whether ProSe is authorized for this UE Identity. If not, a Result Code of `DIAMETER_ERROR_UNAUTHORIZED_SERVICE` shall be returned.

If there is an error in any of the above steps then the ProSe Function shall stop processing the request and shall return the error code specified in the respective step.

If the ProSe Function cannot fulfil the received request for reasons not stated in the above steps, e.g. due to a database error or any of the required actions cannot be performed, it shall stop processing the request and set the Result Code to `"DIAMETER_UNABLE_TO_COMPLY"`.

Otherwise, when the UE is authorized to use ProSe Direct Discovery or ProSe Direct Communication in this PLMN, the ProSe Function shall return the authorization data in the response, according to the supported/unsupported features of the ProSe Function in the Local PLMN or VPLMN, and the authorised announcing range (short/medium/long) at which and if the UE is allowed to announce in the VPLMN according to the defined announcing authorisation policy for this UE (see 3GPP TS 24.333 [26] for the possible values of the range) and shall set the Result Code to `"DIAMETER_SUCCESS"`.

5.3 ProSe Direct Discovery Authorization

5.3.1 General

The ProSe Direct Discovery Authorization Procedure shall be used between the ProSe Function in the HPLMN and the ProSe Function in a Local PLMN or VPLMN to obtain authorization for access to the discovery resources and perform ProSe Direct Discovery. The procedure shall be invoked by the ProSe Function in the HPLMN and is used:

- to request the ProSe Function in the VPLMN or Local PLMN for the authorization for ProSe Direct Discovery announcing when the announcing UE is roaming in the VPLMN or announcing in a Local PLMN;
- to perform the resolution ProSe Application ID Name to ProSe Application Code and/or ProSe Application Mask when the ProSe Application ID has PLMN-specific scope for open ProSe Direct discovery;
- to notify the ProSe Function in Local PLMN that the previously allocated ProSe Discovery Filter for a ProSe Application ID which has PLMN-specific scope is no longer monitored by a monitoring UE of the HPLMN;
- to perform the resolution of a target RPAUID to a ProSe Restricted Code or ProSe Restricted Code Prefix for restricted ProSe Direct Discovery;
- to provide the ProSe Function in the Local PLMN or VPLMN with the application identity in order to allow it to perform charging;
- to provide the ProSe Function in the Local PLMN or VPLMN with the UE identity (i.e. IMSI or MSISDN) in order to allow to perform charging;
- to provide the ProSe Function in VPLMN with the allocated ProSe Application Code, ProSe Restricted Code or ProSe Restricted Code Prefix/Suffix Pool, and the corresponding validity timer, or a notification of the termination or change of the allocated ProSe-related codes, in order to allow to perform charging.
- to provide the ProSe Function in VPLMN with the allocated ProSe Query Code or ProSe Response Code and the corresponding validity timer when such a code is announced in restricted ProSe Direct Discovery model B procedure, in order to allow to perform charging.
- to provide the ProSe Function in VPLMN/Local PLMN with the allocated ProSe Query Code, ProSe Response Code and associated validity timer for a given RPAUID using restricted ProSe Direct Discovery model B.