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LTE;
Proximity-services (ProSe)
function to ProSe application server aspects (PC2);
Stage 3
(3GPP TS 29.343 version 15.1.0 Release 15)**



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1 Scope

This document provides the stage 3 specification of the PC2 reference point. The functional requirements and the stage 2 procedures of the PC2 reference point are contained in 3GPP TS 23.303 [2]. The PC2 reference point lies between the ProSe Function and ProSe Application Server.

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] Void.
- [4] IETF RFC 791: "Transmission Control Protocol".
- [5] IETF RFC 4960: "Stream Control Transmission Protocol".
- [6] 3GPP TS 33.303: "Proximity-based Services (ProSe); Security aspects".
- [7] 3GPP TS 29.345: "Inter-Proximity-services (ProSe) Function signalling aspects; Stage 3".
- [8] IETF RFC 5719: "Updated IANA Considerations for Diameter Command Code Allocations".
- [9] IETF RFC 2234: "Augmented BNF for syntax specifications".
- [10] 3GPP TS 24.334: "Proximity-services (ProSe) User Equipment (UE) to Proximity-services (ProSe) Function Protocol aspects; Stage 3".
- [11] IETF RFC 8583: "Diameter Load Information Conveyance".
- [12] IETF RFC 6733: "Diameter Base Protocol".

3 Definitions 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]. The term definition in the present document has a reference to that in 3GPP TS 23.303 [2].

Announcing UE: The UE that announces certain information that could be monitored by UEs in proximity that have permission to discover.

Discoverer UE: The UE that receives the request message and responds with certain information related to the discoverer UE's request.

Discoverer UE: The UE that transmits a request containing certain information about what it is interested to discover.

Monitoring UE: The UE that monitors certain information of interest in proximity of announcing UEs.

EPC-level ProSe Discovery: A ProSe Discovery procedure by which the EPC determines the proximity of two ProSe-enabled UEs and informs them of their proximity.

Model A: involves one UE announcing "I am here" in restricted ProSe direct discovery.

Model B: involves one UE asking "who is there" and/or "are you there" in restricted ProSe direct discovery.

ProSe Discovery: A process that identifies that a UE that is ProSe-enabled is in proximity of another, using E-UTRA (with or without E-UTRAN) or EPC.

ProSe Discovery UE ID: A temporary identifier assigned by the ProSe Function in the HPLMN to the UE for the restricted direct discovery service. It includes the PLMN ID and a temporary identifier that uniquely identifies the UE in the HPLMN.

ProSe Function ID: An FQDN that identifies a ProSe Function.

Restricted ProSe Application User ID: An identifier associated with the Application Layer User ID in the ProSe Application Server in order to hide/protect the application level user identity from the 3GPP layer. It unambiguously identifies the user within a given application. The format of this identifier is outside the scope of 3GPP.

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].

ACE	Application-Controlled Extension
ALUID	Application Layer User ID
AVP	Attribute-Value Pair
EPUID	EPC ProSe User ID
PDUID	ProSe Discovery UE ID
PFID	ProSe Function ID
ProSe	Proximity-based Services
RPAUID	Restricted ProSe Application User ID

4 PC2 reference point

4.1 PC2 reference model

Proximity Services (ProSe) are services that can be provided by the 3GPP system based on UEs being in proximity to each other. The PC2 reference point is located between the ProSe Application Server and the ProSe Function. It is used to define the interaction between ProSe Application Server and ProSe functionality provided by the 3GPP EPS via ProSe Function (e.g. name translation) for open ProSe direct discovery, restricted ProSe direct discovery and EPC-level ProSe discovery.

The stage 2 level requirements for the PC2 reference point are defined in 3GPP TS 23.303 [2]. The relationships between the functional entities are depicted in Figure 4.1.1.

NOTE: For EPC-level ProSe discovery the roaming architecture is not specified in this release.

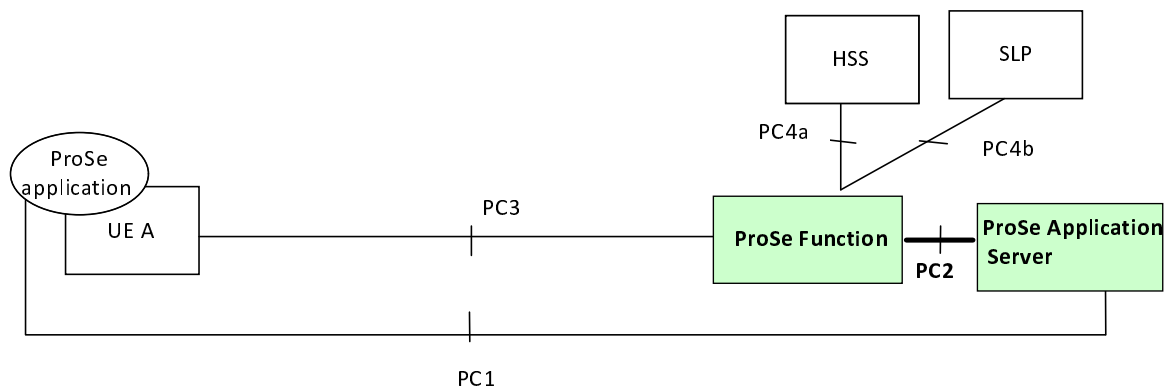


Figure 4.1.1: PC2 reference point in ProSe Architecture

4.2 Functional elements

4.2.1 ProSe Function

The ProSe Function is the logical function that is used for network related actions required for ProSe. The ProSe Function plays different roles for each of the features of ProSe. In this version of the specification it is assumed that there is only one logical ProSe Function in each PLMN that supports Proximity Services.

Over PC2 reference point, the ProSe Function supports EPC-level discovery by the following functionality:

- Storage of a list of applications that are authorized to use EPC-level ProSe Discovery.
- Handling of EPC ProSe User IDs and Application Layer User IDs;
- Exchange of signalling with 3rd party Application Servers for application registration and identifier mapping;

The ProSe Function also supports open ProSe direct discovery and restricted ProSe direct discovery by the following functionality:

- Generates and maintains the ProSe Discovery UE ID (PDUID) for restricted ProSe direct discovery.
- Initiates authorization of the discovery requests over PC2 reference point.

The ProSe Function provides the necessary charging and security functionality for usage of ProSe via the EPC.

4.2.2 ProSe Application Server

The ProSe Application Server supports the following functionality:

- Storage of EPC ProSe User IDs, ProSe Function IDs, ProSe Discovery UE ID, metadata and RPAUIDs;
- Mapping of Application Layer User IDs and EPC ProSe User IDs.
- Mapping of RPAUID and PDUID for restricted ProSe direct discovery.
- Maintaining permission information for the restricted ProSe direct discovery using RPAUIDs;
- Allocation of the ProSe Restricted Code Suffix pool, if restricted direct discovery with application-controlled extension is used;
- Allocation of the mask(s) for ProSe Restricted Code Suffix, if restricted direct discovery with application-controlled extension is used;
- Allocation of the mask(s) for ProSe Application Code Suffix, if open direct discovery with application-controlled extension is used.

5 PC2 procedures

5.1 EPC-level ProSe discovery

5.1.1 Application registration for ProSe

5.1.1.1 General Description

The application registration procedure is used by a ProSe Function serving the originating UE to request the ProSe Application Server to register the UE's Application Layer User ID (ALUID) with an EPC ProSe User ID (EPUID).

This procedure uses the Diameter commands ProXimity-Action-Request (PXR) and ProXimity-Action-Answer (PXA) in the Diameter application as specified in clause 6.

5.1.1.2 Detailed description of the application registration for ProSe procedure

The ProSe Function of the UE triggering the ProSe EPC-level discovery application registration procedure shall send the ProXimity-Action-Request (PXR) command to the ProSe Application Server of the specific application requested by the UE in its initial Application Registration message. The ProSe Function shall include in the request the ProSe-Request-Type AVP with the value APPLICATION_REGISTRATION_FOR_PROSE (0), the Requesting-EPUID AVP with the EPC ProSe User ID of the originating UE, the Origin-App-Layer-User-Id AVP with the Application Layer User Identity of the originating UE, and the ProSe-Function-ID AVP with the ProSe Function Identity of the originating UE.

When receiving a PXR command for application registration from a ProSe Function, the ProSe Application Server shall process the request and respond to the ProSe Function with a PXA command.

If the ProSe Application Server accepts the PXR command, it acknowledges the reception of the PXR command for ProSe application registration and sets the Result-Code AVP to "SUCCESS" in the PXA command. When receiving PXA from the ProSe Application Server, the ProSe Function of the originating UE checks the Result-Code AVP. If it indicates SUCCESS, the ProSe Function notifies the originating UE, according to the ProSe EPC-level discovery application registration procedure as specified in clause 7.2.3 of 3GPP TS 24.334 [10]. In case of an unsuccessful application registration request, applicable value defined in clause 6.7.3 shall be used to indicate the cause.

5.1.2 Proximity map request

5.1.2.1 General

The Proximity map request procedure may be used by the ProSe Function to request the EPC ProSe User identity for a targeted application user for which the originating UE shall get alerts when in proximity of the targeted UE, and the identity of the ProSe Function for this targeted UE as well. The identity of the ProSe Function is used in the execution of the Proximity Request procedure described in 3GPP TS 29.345 [7].

5.1.2.2 Detailed description of the proximity map request procedure

To apply this procedure, the ProSe Function shall send a ProXimity-Action-Request (PXR) command including the ProSe-Request-Type AVP with the value PROSE_MAP_REQUEST (1), the Origin-App-Layer-User-ID AVP indicating the application layer user identity of the originating UE and the Target-App-Layer-User-ID AVP indicating the application layer user identity of the targeted UE.

Upon reception of a PXR command including the Origin-App-Layer-User-ID AVP and the Target-App-Layer-User-ID AVP, the ProSe Application Server shall determine whether the originating UE is allowed to discover the targeted UE.

The ProSe Application Server shall then send a ProXimity-Action-Answer (PXA) command including the Targeted-EPUID AVP and ProSe-Function-ID AVP indicating the targeted UE and the corresponding ProSe Function ID respectively.

In case of an unsuccessful proximity map request, applicable value defined in clause 6.7.3 shall be used to indicate the cause.

5.2 Restricted ProSe direct discovery

5.2.1 Overview

Restricted ProSe direct discovery is a process that a UE detects and identifies another UE in proximity using E-UTRA direct radio signals with explicit permission of the UE that is being discovered. Detailed description of ProSe direct discovery refers to 3GPP TS 23.303 [2] clause 5.3. There are two models that restricted ProSe direct discovery applies:

Model A ("I am here")

Two roles of ProSe-enabled UEs are involved in this model: Announcing UE and Monitoring UE. The announcing UE broadcasts discovery messages at pre-defined discovery intervals and the monitoring UEs that are interested in these messages read them and process them.

Model B ("who is there?" / "are you there?")

Two roles of ProSe-enabled UEs are involved in this model: Discoverer UE and Discoveree UE. It is equivalent to "who is there/are you there" since the discoverer UE sends information about other UEs that would like to receive responses from, e.g. the information can be about a ProSe Application Identity corresponding to a group and the members of the group can respond.

5.2.2 Authorization for Announce Request (model A)

5.2.2.1 General Description

The announce authorization procedure (model A) is used by the ProSe Function serving the originating UE to obtain announce authorization information related to restricted ProSe direct discovery. The procedure is invoked by the ProSe Function and is used for the following purposes:

- to request the ProSe Application Server to map the UE's Restricted ProSe Application User ID (RPAUID) to the corresponding ProSe Discovery UE ID(s) (PDUID(s)).

5.2.2.2 Detailed description of the procedure

To apply this procedure, the ProSe Function of the UE triggering the restricted ProSe direct discovery announce request procedure shall send the ProXimity-Action-Request (PXR) command to the ProSe Application Server of the specific application requested by the UE in its initial request message. The ProSe Function shall include in the request the ProSe-Request-Type AVP with the value AUTHORIZATION_ANNOUNCE (2) and the Requesting-RPAUID AVP with the RPAUID assigned for this application to the originating UE.

When receiving a PXR command for announce authorization for restricted ProSe direct discovery, the ProSe Application Server shall acknowledge the reception of the PXR command and shall send a PXA command with the Result-Code AVP set to "SUCCESS", with one or more PDUID AVPs set to each PDUID associated with the requesting RPAUID. In case of an unsuccessful announce authorization request for restricted ProSe direct discovery, applicable value defined in clause 6.7.3 shall be used to indicate the cause.

When receiving PXA from the ProSe Application Server, the ProSe Function of the originating UE checks the Result-Code AVP. If it indicates SUCCESS, the ProSe Function verifies that there exists one received PDUID belonging to the requesting UE, and notifies the originating UE, according to the procedure specified in 3GPP TS 24.334 [10].

5.2.3 Authorization for Announce Request with Application-controlled extension (model A)

5.2.3.1 General Description

The announce authorization procedure (model A) with application-controlled extension is used by the ProSe Function serving the originating UE to obtain announce authorization information related to restricted ProSe direct discovery. The procedure is invoked by the ProSe Function and is used for the following purposes: