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**Title: TS 23.304: Terminology alignment across the TS**

**Document for: Approval**

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***Abstract****: This contribution proposes terminology alignment across the TS 23.304.*

# 1. Introduction

The following terms are aligned across the TS 23.304:

5G ProSe-enabled UE

5G ProSe UE-to-Network Relay, 5G ProSe Layer-3 UE-to-Network Relay, 5G ProSe Layer-2 UE-to-Network Relay

5G ProSe Remote UE, 5G ProSe Layer-3 Remote UE, 5G ProSe Layer-2 Remote UE

Indirect Network Communication

# 2. Proposal

It is proposed to capture the following changes into TS 23.304.

\* \* \* \* First change \* \* \* \*

## 3.1 Terms

For the purposes of the present document, the terms 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].

**5G ProSe-enabled UE:** A UE that supports 5G ProSe requirements and associated procedures.

**5G ProSe Direct Discovery:** A procedure employed by a 5G ProSe-enabled UE to discover other 5G ProSe-enabled UEs in its vicinity based on direct radio transmissions between the two UEs with NR technology.

**5G ProSe Direct Communication:** A communication between two or more UEs in proximity that are 5G ProSe-enabled, by means of user plane transmission using NR technology via a path not traversing any network node.

**5G ProSe UE-to-Network Relay:** A 5G ProSe-enabled UE that provides functionality to support connectivity to the network for 5G ProSe Remote UE(s).

**5G ProSe Remote UE:** A 5G ProSe-enabled UE that communicates with a DN via a 5G ProSe UE-to-Network Relay.

**Application Layer ID:** An identity identifying a 5G ProSe-enabled UE within the context of a specific application. The format of this identifier is outside the scope of 3GPP.

**Direct Network Communication:** One mode of network communication, where there is no 5G ProSe UE-to-Network Relay between a UE and the 5G network.

**Indirect Network Communication:** One mode of network communication, where there is a 5G ProSe UE-to-Network Relay between a UE and the 5G network.

**Member ID:** An identifier uniquely identifying a member in the Application Layer managed group and that is managed by the ProSe application layer.

**Mode of communication:** Mode of communication to be used by the 5G ProSe-enabled UE over PC5 reference point, i.e. broadcast mode, groupcast mode or unicast mode.

**Open ProSe Discovery**: ProSe Direct Discovery without explicit permission from the 5G ProSe-enabled UE being discovered, according to TS 22.278 [7].

**Restricted ProSe Discovery**:ProSe Direct Discovery that only takes place with explicit permission from the 5G ProSe-enabled UE being discovered, according to TS 22.278 [7].

**User Info ID:** The User Info ID is configured for Model A or Model B Direct Discovery either for public safety or commercial applications based on the policy of the HPLMN or via the ProSe application server that allocates it. The User Info ID is sent by the announcing or discoverer or discoveree UE over the air. The definition of values of User Info ID is out of scope of this specification.

For the purposes of the present document, the following term and definition given in TS 23.303 [3] apply:

**Application Layer Group ID**

**Destination Layer-2 ID**

**Discovery Entry ID**

**Discovery Filter**

**Discovery Query Filter**

**Discovery Response Filter**

**Geographical Area**

**Local PLMN**

**Model A**

**Model B**

**Metadata Index**

**Metadata Index Mask**

**ProSe Application ID**

**ProSe Application Code**

**ProSe Application Mask**

**ProSe Query Code**

**ProSe Response Code**

**ProSe Restricted Code**

**ProSe Restricted Code Prefix**

**ProSe Restricted Code Suffix**

**ProSe Discovery UE ID**

**ProSe Layer-2 Group ID**

**Restricted ProSe Application User ID**

**Source Layer-2 ID**

\* \* \* \* Second change \* \* \* \*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AS layer Access Stratum layer

DDNMF Direct Discovery Name Management Function

PDUID ProSe Discovery UE ID

PFI PC5 QoS Flow Identifier

PQI PC5 5QI

ProSe Proximity based Services

RPAUID Restricted ProSe Application User ID

RSC Relay Service Code

\* \* \* \* Third change \* \* \* \*

### 4.2.7 5G ProSe UE-to-Network Relay reference architecture

#### 4.2.7.1 5G ProSe Layer-3 UE-to-Network Relay reference architecture

The following figure 4.2.7.1-1 show the high level reference architecture for 5G ProSe Layer-3 UE-to-Network Relay. In this figure, the 5G ProSe Layer-3 UE-to-Network Relay may be in the HPLMN or a VPLMN.



Figure 4.2.7.1-1: Reference architecture for 5G ProSe Layer-3 UE-to-Network Relay

The following figure 4.2.7.1-2 show the non-roaming reference architecture for 5G ProSe Layer-3 UE-to-Network Relay when N3IWF is supported. In this figure, the PLMN A and PLMN B may be the same or different. When the 5G ProSe Layer-3 Remote UE may connect to NG-RAN directly to access PLMN B, and in that case it would take the role of UE in the figure.



Figure 4.2.7.1-2: Non-roaming architecture model for 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

The following figure 4.2.7.1-3 show the roaming reference architecture for 5G ProSe Layer-3 UE-to-Network Relay. In this figure, the PLMN A and PLMN C may be the same or different.



Figure 4.2.7.1-3: Roaming architecture model for 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

#### 4.2.7.2 5G ProSe Layer-2 UE-to-Network Relay reference architecture

Figure 4.2.7.2-1 show the 5G ProSe Layer-2 UE-to-Network Relay reference architecture. The 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay may be served by the same or different PLMNs. If the serving PLMNs of the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 UE-to-Network Relay are different then NG-RAN is shared by the serving PLMNs, see the 5G MOCN architecture in clause 5.18 of TS 23.501 [4].



Figure 4.2.7.2-1: 5G ProSe Layer-2 UE-to-Network Relay reference architecture

NOTE 1: Uu between the 5G ProSe Layer-2 Remote UE and NG-RAN consists of RRC, SDAP and PDCP.

NOTE 2: The 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay are served by the same NG-RAN. The Core Network entities (e.g., AMF, SMF, UPF) serving the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 UE-to-Network Relay can be the same or different.

\* \* \* \* Fourth change \* \* \* \*

### 4.3.1 UE

Any 5G ProSe-enabled UE may support the following functions:

- Exchange of information for 5G ProSe Direct Discovery between 5G ProSe-enabled UE and the 5G DDNMF over PC3a reference point.

- Procedures for 5G ProSe Direct Discovery of other 5G ProSe-enabled UEs over PC5 reference point.

- Procedures for 5G ProSe Direct Communication over PC5 reference point, including Broadcast, Groupcast and Unicast mode 5G ProSe Direct Communication.

- Procedures to act as a 5G ProSe Layer-2 UE-to-Network Relay.

- Procedures to act as a 5G ProSe Layer-3 UE-to-Network Relay.

- Procedures to act as a 5G ProSe Layer-2 Remote UE.

- Procedures to act as a 5G ProSe Layer-3 Remote UE.

- Indicate 5G ProSe Policy Provisioning Request in UE Policy Container for Registration Request or UE triggered 5G ProSe Policy provisioning, which may contain one or multiple capabilities as listed below:

- 5G ProSe-enabled UE for ProSe Direct Discovery;

- 5G ProSe-enabled UE for ProSe Direct Communication;

- 5G ProSe Layer-2 Remote UE;

- 5G ProSe Layer-3 Remote UE;

- 5G ProSe Layer-2 UE-to-Network Relay;

- 5G ProSe Layer-3 UE-to-Network Relay.

- Receive the 5G ProSe Policy from 5GC over N1 reference point.

- Configuration of parameters for 5G ProSe Direct Discovery and 5G ProSe Direct Communication (e.g., including IP addresses, ProSe Layer-2 Group IDs, see clause 5.1). These parameters can be pre-configured in the UE, or, if in coverage, provisioned or updated by signalling over the N1 reference point from the PCF in the HPLMN or over PC1 reference point from the ProSe Application Server.

- Report the following capabilities to 5GC over the N1 reference point:

- 5G ProSe Capability.

### 4.3.2 5G DDNMF

#### 4.3.2.1 General

The 5G DDNMF is the logical function handling network related actions required for dynamic 5G ProSe Direct Discovery. In this version of the specification, it is assumed that there is only one logical 5G DDNMF in each PLMN that supports 5G ProSe Direct Discovery service.

NOTE: If multiple 5G DDNMFs are deployed within the same PLMN (e.g., for load reasons), the method to locate the 5G DDNMF that has allocated a specific ProSe Application Code or ProSe Restricted Code (e.g. through a database lookup, etc.) is not defined in this version of the specification.

The 5G DDNMF interacts with the 5G ProSe-enabled UE using procedures over PC3a reference point defined in clause 6.3.1 to allocate and resolve the mapping of ProSe Applications IDs and ProSe Application Codes used in 5G ProSe Direct Discovery. It uses ProSe related subscriber data stored in UDM for the authorisation of each discovery request. It also provides the UE with the necessary security material in order to protect discovery messages transmitted over the air. In restricted 5G ProSe Direct Discovery, it also interacts with the Application Server via N67 reference points or with other 5G DDNMFs via N65/N66 reference points for the authorization of the discovery requests.

The 5G ProSe-enabled UE use procedure defined in clause 4.3.2.2 to discovery the 5G DDNMF in the HPLMN. Based on the UE Local Configuration or URSP as defined in TS 23.503 [9], an existing PDU session is selected or a new PDU session is established, to carry the control signalling between the UE and the 5G DDNMF in the HPLMN.

The 5G DDNMF provides the necessary charging functionality or charging information for the usage of 5G ProSe Direct Discovery and/or ProSe Direct Communication to interact with CHF or for the provision to CEF.

The 5G DDNMF in the HPLMN may interact with the 5G DDNMF in a VPLMN or Local PLMN in order to manage the 5G ProSe Direct Discovery service.

The 5G DDNMF gets the PDUID from the PCF and subscribes to notifications on Change of PDUID.

### 4.3.3 PCF

In addition to the functions defined in TS 23.501 [4] and TS 23.503 [9], the PCF includes functions to provision the UE with necessary policies and parameters to use 5G ProSe services, as part of the UE ProSe Policy information as defined in TS 23.503 [9] clause 4.2.2, based on the UE capabilities listed in clause 4.3.1 in the 5G ProSe Policy Provisioning Request:

- PC5 usage reporting configuration.

- Authorization policy and parameters for 5G ProSe Direct Discovery and Communication.

- Authorization policy and parameters for 5G ProSe UE-to-Network Relay Discovery and Communication (i.e. as 5G ProSe Layer-2 Remote UE, as 5G ProSe Layer-3 Remote UE, as 5G ProSe Layer-2 UE-to-Network Relay, as 5G ProSe Layer-3 UE-to-Network Relay).

- PDUID allocation with its validity timer.

The PCF may update the 5G ProSe policy and parameters to the UE under certain conditions.

When receiving the 5G ProSe Capability in Npcf\_UEPolicyControl\_Create Request from the AMF or when receiving the updated subscription data from UDR, the PCF generates the PC5 QoS parameters used by NG-RAN corresponding to a UE as defined in clause 5.4.2 of TS 23.287 [2].

### 4.3.4 AMF

In addition to the functions defined in TS 23.501 [4], the AMF performs the following functions:

- Select a PCF supporting 5G ProSe Policy/Parameter provisioning based on indication of 5G ProSe Capability as part of the "5GMM capability" in the Registration Request.

- Stores the 5G ProSe Capability.

- Forwards the 5G ProSe Capability to PCF in Npcf\_UEPolicyControl\_Create Request.

- Obtain from UDM the subscription information related to 5G ProSe and store them as part of the UE context data.

- Obtain PC5 QoS parameters from the PCF and store them as part of the UE context data.

- Provision the NG-RAN with indication about the UE authorization status about 5G ProSe Direct Discovery and 5G ProSe Direct Communication (i.e. as 5G ProSe-enabled UE for ProSe Direct Discovery, as 5G ProSe-enabled UE for ProSe Direct Communication), 5G ProSe UE-to-Network Relay Discovery and Communication (i.e. as 5G ProSe Layer-2 Remote UE, as 5G ProSe Layer-2 UE-to-Network Relay, as 5G ProSe Layer-3 UE-to-Network Relay).

- Provision the NG-RAN with PC5 QoS parameters related to 5G ProSe Direct Communication.

### 4.3.5 UDM

In addition to the functions defined in TS 23.501 [4], the UDM performs the following functions:

- Subscription management for 5G ProSe Direct Discovery and Communication.

- Subscription management for 5G ProSe UE-to-Network Relay Discovery and Communication.

### 4.3.8 ProSe Application Server

The ProSe Application Server supports the following functionalities.

For 5G ProSe Direct Discovery:

- Maintains permission information for the restricted 5G ProSe Direct Discovery using RPAUIDs;

- Storage of ProSe Discovery UE IDs and metadata;

- Mapping of RPAUID and PDUID for restricted 5G ProSe Direct Discovery;

- Provisioning parameters for Group Member Discovery to UE.

- Interaction with 5G DDNMF for 5G ProSe Direct Discovery, including:

- 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.

For 5G ProSe Direct Communication:

- Provisioning a path preference for 5G ProSe Services to UDR;

- Provisioning parameters for 5G ProSe Direct Communication to UE.

For 5G ProSe UE-to-Network Relay service:

- Provisioning parameters for 5G ProSe UE-to-Network Relay Discovery and 5G ProSe UE-to-Network Relay Communication to UDR.

### 4.3.9 5G ProSe UE-to-Network Relay

#### 4.3.9.1 General

Both 5G ProSe Layer-2 and Layer-3 UE-to-Network Relay entity provides the relaying functionality to support connectivity to the network for 5G ProSe Remote UEs. It can be used for both public safety services and commercial services (e.g. interactive service).

Both 5G ProSe Layer-2 and Layer-3 UE-to-Network Relay supports the following functions to enable connectivity to the network:

- 5G ProSe UE-to-Network Relay Discovery service as defined in clause 6.3.2.3, to allow discovery by the 5G ProSe Remote UE;

- access the 5GS as a UE as defined in TS 23.501 [4] with the enhancements as specified in clauses 6.2 and 6.6;

- relays unicast traffic (uplink and downlink) between the 5G ProSe Remote UE and the network, supporting IP, Ethernet or Unstructured traffic type.

#### 4.3.9.2 5G ProSe Layer-3 UE-to-Network Relay

In addition to the common 5G ProSe UE-to-Network Relay functions defined in clause 4.3.9.1, 5G ProSe Layer-3 UE-to-Network Relay supports the following functions to enable connectivity to the network:

- 5G ProSe Direct Communication via 5G ProSe Layer-3 UE-to-Network Relay as specified in clause 6.5.1, for the communication with the 5G ProSe Layer-3 Remote UEs for the relay operations;

- end-to-end QoS treatment for the 5G ProSe Layer-3 Remote UE's traffic without N3IWF as defined in clause 5.6.2.1 and when accessing via an N3IWF clause 5.6.2.2;

- IP address management for the 5G ProSe Layer-3 Remote UE as defined in clause 5.5 in case the 5G ProSe Layer-3 Remote UE uses IP traffic type.

#### 4.3.9.3 5G ProSe Layer-2 UE-to-Network Relay

In addition to the common 5G ProSe UE-to-Network Relay functions defined in clause 4.3.9.1, 5G ProSe Layer-2 UE-to-Network Relay supports the following functions to enable connectivity to the network:

- 5G ProSe Direct Communication via 5G ProSe Layer-2 UE-to-Network Relay as specified in clause 6.5.2, for the communication with the 5G ProSe Layer-2 Remote UEs for the relay operations, including end-to-end QoS treatment.

- QoS handling for 5G ProSe Layer-2 UE-to-Network Relay as defined in clause 5.6.2.3.

### 4.3.10 SMF

In addition to the functions defined in TS 23.501 [4], the SMF supports the following function:

- Receiving 5G ProSe Layer-3 Remote UE report and maintaining the information of 5G ProSe Layer-3 Remote UE(s) handled by a 5G ProSe Layer-3 UE-to-Network Relay in the 5G ProSe Layer-3 UE-to-Network Relay's SM context for the PDU Session associated with the relay.

\* \* \* \* Fifth change \* \* \* \*

### 5.1.1 General

In 5GS, the parameters for 5G ProSe Direct Discovery, 5G ProSe Direct Communication, and 5G ProSe UE-to-Network Relay service may be made available to the UE in following ways:

- provisioned in the ME; or

- configured in the UICC; or

- provisioned in the ME and configured in the UICC; or

- provided or updated by the ProSe Application Server via PCF and/or PC1 reference point; or

- provided or updated by the PCF to the UE.

If the same parameters described in clauses 5.1.2.1, 5.1.3.1 and 5.1.4.1 are provided by different sources, the UE shall consider them in the following priority order:

- provided or updated by the PCF (including parameters determined by the PCF itself and parameters provided by the ProSe Application Server to the PCF);

- provided or updated by the ProSe Application Server via PC1 reference point;

- configured in the UICC;

- provisioned in the ME.

The parameters provided or updated by the ProSe Application Server via PC1 reference point may need to be complemented with configuration data from other sources listed above.

NOTE: The ProSe Application Server can provision the same ProSe parameters via 5GC as specified in clause 6.2.5 or directly to the UE via PC1 reference point, and can revoke (e.g. delete) the ProSe parameters via 5GC as specified in clause 6.2.5 in order for the provisioning via PC1 reference point to take effect.

The basic principles of service authorization and provisioning for 5G ProSe Direct Discovery, 5G ProSe Direct Communication, and 5G ProSe UE-to-Network Relay service are as follows:

- The PCF in the HPLMN may configure a list of PLMNs where the UE is authorized to use 5G ProSe Direct Discovery.

- The PCF in the HPLMN may configure a list of PLMNs where the UE is authorised to use 5G ProSe Direct Communication.

- The PCF in the HPLMN may configure a list of PLMNs where the UE is authorised to act as 5G ProSe UE-to-Network Relay. Authorisation for 5G ProSe Layer-2 UE-to-Network Relay and 5G ProSe Layer-3 UE-to-Network Relay are independent of each other.

- The PCF in the HPLMN may configure a list of PLMNs where the UE is authorised to access 5GC via 5G ProSe UE-to-Network Relay (i.e. to act as 5G ProSe Remote UE). Authorisation to access via 5G ProSe Layer-2 UE-to-Network Relay and via 5G ProSe Layer-3 UE-to-Network Relay are independent of each other.

- The PCF in the HPLMN merges authorization information from home and other PLMNs and provides the UE with the final authorization information.

- The PCF in the VPLMN or HPLMN may revoke the authorization (via H-PCF when roaming) at any time by using the UE Configuration Update procedure for transparent UE Policy delivery procedure defined in clause 4.2.4.3 of TS 23.502 [5].

- The ProSe Policy/parameters provisioning to UE is controlled by the PCF and may be triggered by UE. The PCF provisions one or more of the following ProSe Policy/parameters:

- ProSe Policy/parameters for 5G ProSe Direct Discovery as specified in clause 5.1.2.1;

- ProSe Policy/parameters for 5G ProSe Direct Communications as specified in clause 5.1.3.1;

- ProSe Policy/parameters for 5G ProSe Layer-2 and/or Layer-3 UE-to-Network Relay as specified in clause 5.1.4.1;

- ProSe Policy/parameters for 5G ProSe Layer-2 and/or Layer-3 Remote UE as specified in clause 5.1.4.1.

- The PCF includes the 5G ProSe Policy/parameters in a Policy Section identified by a Policy Section Identifier (PSI) as specified in clause 6.1.2.2.2 of TS 23.503 [9].

In addition to the above, ProSe usage reporting configuration and rules for charging can be (pre)configured in the UE or provided by the PCF.

In addition to the above, the path selection policy can be (pre)configured in the UE or provided by the PCF as defined in clause 5.11. A path preference for ProSe Services can be provided by ProSe Application Server to UDR, and may be used by PCF for path selection policy generation and update.

When a 5G ProSe Layer-3 Remote UE is using a 5G ProSe Layer-3 UE-to-Network Relay without involving N3IWF, the PCF based provisioning and update of 5G ProSe Policy/parameters to the 5G ProSe Layer-3 Remote UE are not supported.

#### 5.1.4.1 Policy/Parameter provisioning for 5G ProSe UE-to-Network Relay

The following information is provisioned in the UE in support of the UE assuming the role of a 5G ProSe UE-to-Network Relay:

1) Authorisation policy for acting as a 5G ProSe Layer-3 and/or Layer-2 UE-to-Network Relay when "served by NG-RAN":

- PLMNs in which the UE is authorized to relay traffic for 5G ProSe Layer-3 and/or Layer-2 Remote UEs.

2) ProSe Relay Discovery policy/parameters for 5G ProSe UE-to-Network Relay:

- Includes the parameters that enable the UE to perform 5G ProSe UE-to-Network Relay Discovery when provisioned from the PCF in the ME or configured in the UICC:

- 5G ProSe UE-to-Network Relay Discovery parameters (User Info ID, Relay Service Code(s));

- Default Destination Layer-2 ID(s) for sending and receiving initial signaling of discovery messages;

- For 5G ProSe Layer 3UE-to-Network Relay, the PDU Session parameters (PDU Session type, DNN, SSC Mode, S-NSSAI, Access Type Preference) to be used for the relayed traffic for each ProSe Relay Service Code;

- Includes security related content for 5G ProSe UE-to-Network Relay Discovery for each ProSe Relay Service Code.

Editor's note: Whether the security parameters can be provided by the PCF and details of security parameters will be determined by SA3 WG.

NOTE 1: 5G ProSe Relay Discovery policy/parameters can be provided from ProSe Application Server to the 5G ProSe UE-to-Network Relay.

3) For 5G ProSe Layer 3 UE-to-Network Relay, QoS mapping(s):

- Each QoS mapping entry includes:

- a mapping between a 5QI value and a PQI value;

- a PQI PDB adjustment factor, for the PC5 communication for the 5G ProSe Layer-3 UE-to-Network Relay operation;

- optional the Relay Service Code(s) associates with the QoS mapping entry.

4) For 5G ProSe Layer 3 UE-to-Network Relay to relay Ethernet or Unstructured traffic from 5G ProSe Layer-3 Remote UE by using IP type PDU Session,

- Mapping of ProSe Service(s) to ProSe Application Server address information (consisting of IP address/FQDN and transport layer port number).

The following information is provisioned in the UE in support of the UE assuming the role of a 5G ProSe Remote UE and thereby enabling the use of a 5G ProSe UE-to-Network Relay:

1) Authorisation policy for using a 5G ProSe Layer-3 and/or Layer-2 UE-to-Network Relay:

- Indicates whether the UE is authorised to use a 5G ProSe Layer-3 and/or Layer-2 UE-to-Network Relay.

2) Policy/parameters for 5G ProSe UE-to-Network Relay Discovery:

- Includes the parameters for 5G ProSe Relay Discovery and for enabling the UE to connect to the 5G ProSe UE-to-Network Relay after discovery when provisioned from the PCF in the ME or configured in the UICC:

- 5G ProSe UE-to-Network Relay Discovery parameters (User Info ID, Relay Service Code(s));

- Default Destination Layer-2 ID(s) for sending and receiving initial signaling of discovery messages;

- For 5G ProSe Layer-3 UE-to-Network Relay, the PDU Session parameters (PDU Session type, DNN, SSC Mode, S-NSSAI, Access Type Preference) to be used for the relayed traffic for each ProSe Relay Service Code;

- Includes security related content for 5G ProSe UE-to-Network Relay Discovery for each ProSe Relay Service Codes.

Editor's note: Whether the security parameters can be provided by the PCF and details of security parameters will be determined by SA3 WG.

NOTE 2: ProSe Relay Discovery policy/parameters can be provided from ProSe Application Server to the 5G ProSe Remote UE.

The following information is provisioned in the UE in support of the UE assuming the role of a 5G ProSe UE-to-Network Relay as well as in the UE in support of the UE assuming the role of a 5G ProSe Remote UE and thereby enabling the use of a 5G ProSe UE-to-Network Relay:

1) Radio parameters for 5G ProSe UE-to-Network Relay Discovery when the UE is not "served by NG-RAN ":

- Includes the radio parameters NR PC5 with Geographical Area(s) and an indication of whether they are "operator managed" or "non-operator managed". The UE uses the radio parameters to perform 5G ProSe Direct Discovery over PC5 reference point when "not served by NG-RAN" only if the UE can reliably locate itself in the corresponding Geographical Area. Otherwise, the UE is not authorized to transmit.

2) Radio parameters for 5G ProSe UE-to-Network Relay Communication when the UE is not "served by NG-RAN":

- Includes the radio parameters NR PC5 with Geographical Area(s) and an indication of whether they are "operator managed" or "non-operator managed". The UE uses the radio parameters to perform 5G ProSe Direct Communication over PC5 reference point when "not served by NG-RAN" only if the UE can reliably locate itself in the corresponding Geographical Area. Otherwise, the UE is not authorized to transmit.

\* \* \* \* Sixth change \* \* \* \*

### 5.2.3 5G ProSe UE-to-Network Relay Discovery

For a high-level description of 5G ProSe UE-to-Network Relay discovery, see clauses 5.4.

### 5.2.4 5G ProSe Direct Discovery Characteristics

5G ProSe Direct Discovery over the PC5 reference point has the following characteristics:

- PC5 communication channel is used to carry the discovery message over PC5. The discovery message over PC5 is differentiated with other PC5 messages by AS layer.

- ProSe layer shall indicate to AS layer whether the signalling is discovery message or PC5-S signalling.

NOTE: The discovery message format is defined in stage 3.

Editor's note: Whether and how to transmit metadata in discovery message depends on the size of the discovery message, it needs to be confirmed by RAN WG.

Group discovery/management to support on demand-based group communication for commercial services has the following characteristics:

- The group discovery/formation/management can be carried out in the Application layer in coordination with the Application Server.

- Application layer signalling between the UE and the Application Server is out of scope of this specification.

Editor's note: It is FFS on how the Application layer discovery messages are exchanged over PC5 reference point between UEs.

5G ProSe Direct Discovery with 5G DDNMF has the following characteristics:

- 5G DDNMF in the 5GS is used for 5G ProSe Direct Discovery Code management (including allocation and resolution). The 5G DDNMF gets the PDUID from the PCF and subscribes to notifications on Change of PDUID.

- 5G DDNMF is defined in clause 4.3.2 and the detail procedure for 5G ProSe Direct Discovery with 5G DDNMF is defined in clause 6.3.

Group discovery/management to support public safety has the following characteristics:

- Pre-configured or provisioned information can be used for the 5G ProSe Direct Discovery procedure as defined in clause 5.1.2.

The information elements included in the 5G ProSe Direct Discovery messages are described in clause 5.8.1 and clause 6.3.2.

\* \* \* \* Seventh change \* \* \* \*

### 5.3.1 General

5G ProSe Direct Communication over PC5 reference point is supported when the UE is "served by NR or E-UTRA" or when the UE is "not served by NR or E-UTRA". A UE is authorized to perform 5G ProSe Direct Communication when it has valid authorization and configuration as specified in clause 5.1.3. 5G ProSe Direct Communication supports both the cases of public safety and commercial service.

5G ProSe Direct Communication over NR based PC5 reference point supports broadcast mode, groupcast mode, and unicast mode.

For broadcast and groupcast mode 5G ProSe Direc Communication, the following data unit types are supported: IPv4, IPv6, Ethernet, Unstructured, and Address Resolution Protocol (see RFC 826 [19]).

Editor's note: Whether the data unit type of Address Resolution Protocol is supported needs to be coordinated with RAN WG.

For unicast mode 5G ProSe Direct Communication, the following data unit types are supported: IPv4, IPv6, Ethernet, and Unstructured.

The identifiers used in the 5G ProSe Direct Communication over PC5 reference point are described in clause 5.8.2.

The QoS handling and procedures for the 5G ProSe Direct Communication over PC5 reference point are defined in clauses 5.6 and 6.4.

\* \* \* \* Eighth change \* \* \* \*

### 5.4.1 5G ProSe Layer-3 UE-to-Network Relay

#### 5.4.1.1 General

The 5G ProSe Layer-3 UE-to-Network Relay shall provide generic function that can relay any IP, Ethernet or Unstructured traffic:

- For IP traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay uses IP type PDU Session towards 5GC.

- For Ethernet traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay can use Ethernet type PDU Session or IP type PDU Session towards 5GC.

- For Unstructured traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay can use Unstructured type PDU Session or IP type PDU Session (i.e. IP encapsulation/de-capsulation by 5G ProSe Layer-3 UE-to-Network Relay) towards 5GC.

The type of traffic supported over PC5 reference point is indicated by the 5G ProSe Layer-3 UE-to-Network Relay e.g. using the corresponding RSC. The 5G ProSe Layer-3 UE-to-Network Relay determines the PDU Session Type based on configuration of the mapping between PDU Session parameters and RSC, as specified in clause 5.1.4.1.

IP type PDU Session and Ethernet type PDU Session can be used to support more than one 5G ProSe Layer-3 Remote UEs while Unstructured type PDU Session can be used to support only one 5G ProSe Layer-3 Remote UE.

NOTE 1: The maximum number of PDU Sessions can affect the maximum number of 5G ProSe Layer-3 Remote UEs that the 5G ProSe UE-to-Network Relay can support.

NOTE 2: Non-unicast mode communication (i.e. one-to-many communication/broadcast or multicast) between network and 5G ProSe Layer-3 UE-to-Network Relay UE and between 5G ProSe Layer-3 UE-to-Network Relay and 5G ProSe Layer-3 Remote UE(s) is not supported in this release of the specification.

#### 5.4.1.2 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

To support 5G ProSe Layer-3 Remote UE services with end-to-end confidentiality and IP address preservation requirements, the 5G ProSe Layer-3 UE-to-Network Relay with N3IWF shall provide access to the 5GC for the 5G ProSe Layer-3 Remote UE via N3IWF using the features defined in clause 4.2.8 and clause 5.30.2.7 of TS 23.501 [4].

5G ProSe Layer-3 UE-to-Network Relay is provisioned with RSC(s) and the corresponding PDU session parameters (e.g. S-NSSAI) to support N3IWF access as part of 5G ProSe Layer-3 UE-to-Network Relay Policy/parameters. When a 5G ProSe Layer-3 Remote UE connects with the corresponding RSC, the 5G ProSe Layer-3 UE-to-Network Relay determines the corresponding PDU session parameters based on the requested RSC.

NOTE: The 5G ProSe Layer-3 UE-to-Network Relay only includes a RSC in discovery message when the corresponding PDU session parameters (e.g. S-NSSAI) are authorized to be used in the accessed network.

When selecting the N3IWF as specified in TS 23.501 [4] clause 6.3.6, the UE uses N3IWF configuration. Selection of the N3IWF follows the regulatory rules of the country where it is located, and when required by the regulations the 5G ProSe Layer-3 Remote UE only selects a N3IWF within the local country. QoS differentiation can be provided on per-IPsec Child Security Association basis and the details are provided in clause 5.6.2.2.

The 5GC to which the 5G ProSe Layer-3 UE-to-Network Relay registers and the 5GC to which the 5G ProSe Layer-3 Remote UE registers may be in the same PLMN or different PLMN.

### 5.4.2 5G ProSe Layer-2 UE-to-Network Relay

The 5G ProSe Layer-2 UE-to-Network Relay provides forwarding functionality that can relay any type of traffic over the PC5 link.

The 5G ProSe Layer-2 UE-to-Network Relay provides the functionality to support connectivity to the 5GS for 5G ProSe Layer-2 Remote UEs. A UE is considered to be a 5G ProSe Layer-2 Remote UE if it has successfully established a PC5 link to the 5G ProSe Layer-2 UE-to-Network Relay. A 5G ProSe Layer-2 Remote UE can be located within NG-RAN coverage or outside of NG-RAN coverage.

For 5G ProSe UE-to-Network Relay Discovery, the standalone discovery is used, and both Model A and Model B are supported.

For PLMN selection and relay selection in the 5G ProSe Layer-2 Remote UE:

- The 5G ProSe Layer-2 Remote UE checks whether the 5G ProSe Layer-2 UE-to-Network Relay's PLMN is authorized for relay, and only the authorized PLMNs are the available PLMNs for NAS PLMN selection;

- The 5G ProSe Layer-2 Remote UE selects the 5G ProSe Layer-2 UE-to-Network Relay based on the selected PLMN by NAS layer.

\* \* \* \* Ninth change \* \* \* \*

## 5.5 IP address allocation

For unicast mode of 5G ProSe direct communication, the following mechanism for IP address/prefix allocation may be used:

a) DHCP-based IPv4 address allocation with one of the two UEs acting as a DHCP server.

b) IPv6 Stateless Address auto configuration specified in RFC 4862 [17] for assignment of IPv6 prefix, with one of the two UEs acting as IPv6 default router.

NOTE 1: Which UE acts as a DHCPv4 server or IPv6 default router is negotiated during secure layer-2 link establishment by exchanging the IP Address Configuration as described in clause 6.4.3.

c) IPv6 link-local addresses as defined in RFC 4862 [17] are formed by UEs locally. The IPv6 link-local addresses are exchanged during the establishment of a secure layer-2 link over PC5. The UEs shall disable duplicate address detection after the layer-2 link is established.

For broadcast and groupcast modes of 5G ProSe direct communication, the following source IP address management applies:

a) the UE configures a link local IPv4 address to be used as the source IP address, as defined in clause 4.5.3 of TS 23.303 [3]. If it is not configured with an address, it uses Dynamic Configuration of IPv4 Link-Local Addresses RFC 3927 [18].

b) the UE configures a link local IPv6 address to be used as the source IP address, as defined in clause 4.5.3 of TS 23.303 [3]. The UE may use this IP address for direct communication without sending Neighbour Solicitation and Neighbour Advertisement message for Duplicate Address Detection.

NOTE 2: The destination IP address management for broadcast and groupcast modes of ProSe direct communication is left to UE implementation.

For communication with a 5G ProSe Layer-3 UE-to-Network Relay, the following mechanism for IP address/prefix allocation applies:

- The PDU Session Type used for the relay traffic shall support the IP version used by the 5G ProSe Layer-3 Remote UE. If the 5G ProSe Layer-3 Remote UE initiates an allocation of IPv4 address or an IPv6 prefix when the requested IP version is not supported in the corresponding PDU Session then IP address/prefix allocation fails.

a) When the 5G ProSe Layer-3 Remote UE uses IPv4 to access the external DN:

a1) The IPv4 address allocation and IPv4 parameter configuration via DHCPv4 are performed according to RFC 2131 [24] and RFC 4039 [25] procedures. The IPv4 address provided to the 5G ProSe Layer-3 Remote UE from the 5G ProSe Layer-3 UE-to-Network Relay by DHCPv4 procedure shall correspond to a local IPv4 address range configured in the 5G ProSe Layer-3 UE-to-Network Relay.

a2) The DHCPv4 request from the 5G ProSe Layer-3 Remote UE is always sent subsequent to the establishment of the one-to-one 5G ProSe Direct Communication between the 5G ProSe Layer-3 Remote UE and the 5G ProSe Layer-3 UE-to-Network Relay, see details for the IPv4 address allocation in clause 5.4.4.3 of TS 23.303 [3].

b) When the 5G ProSe Layer-3 Remote UE uses IPv6 to access the external DN:

b1) IPv6 network prefix allocation via IPv6 Stateless Address auto-configuration. Router solicitation from the 5G ProSe Layer-3 Remote UE is always sent subsequent to the establishment of the one-to-one ProSe Direct Communication between the 5G ProSe Layer-3 Remote UE and the 5G ProSe Layer-3 UE-to-Network Relay, see details for IPv6 prefix allocation in clause 5.4.4.2 of TS 23.303 [3] with the following differences:

- The 5G ProSe Layer-3 UE-to-Network Relay shall obtain the IPv6 prefix assigned to the 5G ProSe Layer-3 Remote UE via prefix delegation function from the network as defined in TS 23.501 [4].

- PDN connection is replaced by PDU Session.

b2) IPv6 parameter configuration via Stateless DHCPv6: The UE may use stateless DHCPv6 for additional parameter configuration.

b3) The 5G ProSe Layer-3 UE-to-Network Relay assigns IPv6 prefixes from IPv6 prefix range that have been assigned to the PDU Session used for the relay traffic via IPv6 prefix delegation.

\* \* \* \* Tenth change \* \* \* \*

### 5.6.2 QoS handling for 5G ProSe UE-to-Network Relay operations

#### 5.6.2.1 QoS handling for 5G ProSe Layer-3 UE-to-Network Relay without N3IWF

For a 5G ProSe Layer-3 Remote UE accessing network via 5G ProSe Layer-3 UE-to-Network Relay without N3IWF, the QoS requirement between 5G ProSe Layer-3 Remote UE and UPF can be satisfied by the corresponding QoS control for the PC5 link between 5G ProSe Layer-3 Remote UE and 5G ProSe Layer-3 UE-to-Network Relay (PC5 QoS control) and the QoS control for the PDU session established between 5G ProSe Layer-3 UE-to-Network Relay and UPF (Uu QoS control). The PC5 QoS is controlled with PC5 QoS rules and PC5 QoS parameters (e.g. PQI, GFBR, MFBR, PC5 LINK-AMBR, Range) as specified in clause 5.4 of TS 23.287 [2]. The Uu QoS is controlled with QoS rules and 5G QoS parameters (e.g. 5QI, GFBR, MFBR) as specified in clause 5.7 of TS 23.501 [4].

As shown in figure 5.6.2.1-1 below, the end-to-end QoS can be met only when the QoS requirements are properly translated and satisfied over the two legs respectively.



Figure 5.6.2.1-1: End-to-End QoS translation for Layer 3 UE-to-Network Relay solution

To achieve this, the QoS mapping can be pre-configured or provided to the 5G ProSe Layer-3 UE-to-Network Relay by the PCF using Prose Policy as specified in clause 5.1.4.1. The QoS mapping includes combinations of the 5QIs and PQIs mapping as entries. The PQI shall have standardized values as defined in Table 5.6.1-1 and in Table 5.4.4-1 of TS 23.287 [2]. The 5QI shall have standardized values as defined in TS 23.501 [4] clause 5.7.4. The QoS mapping also includes an adjustment factor for the PQI's PDB, e.g. 1/5of the standardized PDB value in Table 5.6.1-1 and Table 5.4.4-1 of TS 23.287 [2].

If the QoS Flows setup are initiated by network, the SMF can base on the PCC rules or its local configuration to generates the QoS rules and QoS Flow level QoS parameters (e.g. 5QI, GFBR, MFBR) and signal to the 5G ProSe Layer-3 UE-to-Network Relay using PDU Session Establishment/Modification procedure. For the PDU sessions used for relaying, the SMF always provides the QoS Flow level QoS parameters to the 5G ProSe Layer-3 UE-to-Network Relay when establishes a QoS Flow. Then the 5G ProSe Layer-3 UE-to-Network Relay decides the PC5 QoS parameters for the corresponding PC5 QoS Flow by determining the PQI based the QoS mapping, and the GFBR and MFBR values for the PC5 GBR QoS flow are set equal to the GFBR and MFBR values for the GBR QoS flow respectively. The PCF differentiates the relay traffic based on either local configuration, e.g.by a dedicated DNN or S-NSSAI used for relay traffic or by the traffic filters.

NOTE: Separate QoS mappings can be configured for different RSCs.

If the 5G ProSe Layer-3 Remote UE initiates PC5 QoS Flows setup or modification, the 5G ProSe Layer-3 Remote UE provides PC5 QoS context as defined in TS 23.287 [2], clause 5.4.1.1.3 to the 5G ProSe Layer-3 UE-to-Network Relay, the PC5 QoS context indicates the end-to-end QoS requirements for the traffic transmission between 5G ProSe Layer-3 Remote UE and UPF. If end-end QoS requirements can be supported by an entry in QoS mapping, the 5G ProSe Layer-3 UE-to-Network Relay uses the 5QI of the entry for the Uu QoS control, and uses the PQI of the entry for the PC5 QoS control. If end-end QoS requirements cannot be supported by any entries in QoS mapping, the 5G ProSe Lyaer-3 UE-to-Network Relay, based on its implementation, decides the 5QI for the Uu QoS control and PQI for the PC5 QoS control. If the 5G ProSe Layer-3 Remote UE performs the Layer-2 link modification procedure to add new PC5 QoS Flow(s) or modify the existing PC5 QoS Flow(s) for IP traffic or Ethernet traffic over PC5 reference point, the 5G ProSe Layer-3 Remote UE may also provide the PC5 QoS Rule(s) for the PC5 QoS Flow(s) to be added or modified to the 5G ProSe Layer-3 UE-to-Network Relay. The 5G ProSe Layer-3 UE-to-Network Relay may generate the Packet Filters used over Uu reference point based on the received PC5 QoS Rule(s).

The 5G ProSe Layer-3 UE-to-Network Relay performs the UE requested PDU session Modification as defined in TS 23.502 [5], clause 4.3.3 for authorizing the requested QoS including the 5QI and the Packet Filters. If the PCF authorizes the requested QoS with a different 5QI value, the 5G ProSe Layer-3 UE-to-Network Relay may further update the PQI value based on the authorized 5QI value, and the 5G ProSe Layer-3 UE-to-Network Relay performs the Layer-2 link modification procedure as defined in clause 6.4.3.4 to update the corresponding PC5 QoS Flow with the updated PQI value.

Alternatively, reflective QoS control over Uu as defined in TS 23.501 [4], clause 5.6.5.3 can be leveraged for dynamic QoS handling of 5G ProSe Layer-3 Remote UE to save on signalling between SMF and 5G ProSe Layer-3 UE-to-Network Relay. Upon reception of a DL packet with RQI on the Uu for the 5G ProSe Layer-3 Remote UE, based on the indicated QFI, the 5G ProSe Layer-3 UE-to-Network Relay creates a new derived QoS rule or updates existing derived QoS rule corresponding to the remote UE, as defined in TS 23.501 [4]. The derived QoS rule is for UL packets from the 5G ProSe Layer-3 Remote UE at Uu interface.

Based on signalled QoS rules (via SMF) or derived QoS rules (Uplink Uu via reflective QoS), the 5G ProSe Layer-3 UE-to-Network Relay may use the L2 Link Modification procedures as defined in clause 6.4.3.4 to either update existing PC5 QoS flow or to set up a new PC5 QoS flow (when the QFI to PC5 QoS flow mapping does not exist).

When the 5G ProSe Layer-3 UE-to-Network relay deletes the derived QoS rule e.g. after the RQ Timer expires, the 5G ProSe Layer-3 UE-to-Network Relay may perform L2 Link Modification procedures defined in clause 6.4.3.4 accordingly using the PQI mapped from the 5QI of the currently used QoS rule after the deletion of the derived QoS rule(s).

#### 5.6.2.2 QoS handling for 5G ProSe Layer-3 UE-to-Network relay with N3IWF

When accessing 5GS via a 5G ProSe Layer-3 UE-to-Network Relay with N3IWF, the 5G ProSe Layer-3 Remote UE can request for PDU Session establishment or handover an existing PDU session to the N3IWF using UE requested PDU Session Establishment procedure defined in TS 23.502 [5] clause 4.12.5.



Figure 5.6.2.2-1: End-to-End QoS support via Layer-3 UE-to-Network Relay with N3IWF

For the 5G ProSe Layer-3 Remote UE's PDU session(s) established via N3IWF, QoS differentiation can be provided on per-IPsec Child Security Association basis. N3IWF determines the IPsec child SAs as defined in TS 23.502 [5] clause 4.12. The N3IWF is preconfigured to allocate different IPsec child SAs for QoS Flows with different QoS profiles.

Based on configuration, the N3IWF can use one of the options below for QoS support in 5G ProSe Layer-3 UE-to-Network Relay UE's serving PLMN:

- a static QoS mapping mechanism;

- a dynamic QoS signalling based mechanism.

For the static QoS mapping mechanism, a SLA is established to govern the QoS handling between the 5G ProSe Layer-3 Remote UE's 5GC and the 5G ProSe Layer-3 UE-to-Network Relay UE's 5GC, e.g. when the RSC is configured. The SLA can include the mapping between the DSCP markings for the IPsec child SAs with the Remote UE and the corresponding QoS, and N3IWF IP address(es). The non-alteration of the DSCP field between N3IWF and the 5G ProSe Layer-3 UE-to-Network Relay UE's UPF is also assumed to be governed by an SLA and by transport-level arrangements that are outside of 3GPP scope. The packet detection filters at the 5G ProSe Layer-3 UE-to-Network Relay UE's UPF can be based on the N3IWF IP address and the DSCP markings.

When the dynamic QoS signalling based mechanism is used by N3IWF, it works as follows:

- When the 5G ProSe Layer-3 Remote UE establishes or handovers a PDU session via the N3IWF as described in clause 4.12.5 of TS 23.502 [5], the PCF serving the PDU Session in the 5G ProSe Layer-3 Remote UE's 5GC detects need for specific QoS and provides corresponding PCC rules to SMF in the 5G ProSe Layer-3 Remote UE's 5GC. The resulted QoS information is provided to N3IWF in step 2b of clause 4.12.5 of TS 23.502 [5]. The N3IWF determines the IPSec Child SA(s) and signals to the 5G ProSe Layer-3 Remote UE, as in step 4 of clause 4.12.5 of TS 23.502 [5] via IKE signalling including the PDU Session ID, the QFI(s), optionally a DSCP value, and optionally the Additional QoS Information specified in clause 4.12.5 of TS 23.502 [5]. The PDU Session Establishment Accept message will be sent to the 5G ProSe Layer-3 Remote UE as in step 5 of clause 4.12.5 of TS 23.502 [5].

- Based on Additional QoS Information received from the N3IWF, the 5G ProSe Layer-3 Remote UE determines whether it is necessary to request for QoS session modification for the dedicated QoS Flows toward the 5G ProSe Layer-3 UE-to-Network Relay as described in clause 5.6.2.1. The 5G ProSe Layer-3 Remote UE also provides the N3IWF address, DSCP and the SPI as the traffic filter to enable filtering and mapping of DL traffic towards the right PDU Session/QoS Flow within the 5G ProSe Layer-3 UE-to-Network Relay UE's 5GC.

NOTE: This mechanism allows to communicate GBR related parameters such as GFBR and MFBR from the PCF of the 5G ProSe Layer-3 Remote UE via the N3IWF and the 5G ProSe Layer-3 Remote UE to the 5G ProSe Layer-3 UE-to-Network Relay UE. The 5G ProSe Layer-3 UE-to-Network Relay UE would be able to request the GBR resources from its serving network using UE requested PDU session modification as in clause 4.3.3. of TS 23.502 [5].

- If the 5G ProSe Layer-3 UE-to-Network Relay performs the PDU Session Modification procedure, the PCF in the 5G ProSe Layer-3 UE-to-Network Relay UE's 5GC authorizes the QoS parameters. If the PDU Session Modification procedure authorized the requested QoS parameters, the 5G ProSe Layer-3 UE-to-Network Relay acknowledges the 5G ProSe Layer-3 Remote UE over PC5.

- The PSA UPF in the 5G ProSe Layer-3 UE-to-Network Relay UE's 5GC maps the DL traffic from IPSec Child SA tunnel to appropriate PDU Session/QoS Flow considering SPI and N3IWF address (filters provided by the 5G ProSe Layer-3 Remote UE).

- The 5G ProSe Layer-3 Remote UE's or the 5G ProSe Layer-3 Remote UE's 5GC may initiated PDU Session Modification procedures as specified in clause 4.12.6 of TS 23.502 [5]. When the 5G ProSe Layer-3 Remote UE received QoS information from the N3IWF, the same interactions between the 5G ProSe Layer-3 Remote UE and 5G ProSe Layer-3 UE-to-Network Relay, and between the 5G ProSe Layer-3 UE-to-Network Relay and its 5GC as described above apply.

#### 5.6.2.3 QoS handling for 5G ProSe Layer-2 UE-to-Network Relay

For a 5G ProSe Layer-2 Remote UE accessing network via 5G ProSe Layer-2 UE-to-Network Relay, the existing 5G QoS control is reused between the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 Remote UE's core network. The 5G ProSe Layer-2 Remote UE's SMF provides QoS profiles to NG-RAN, how NG-RAN performs QoS enforcement for PC5 interface (between the 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay) and Uu interface (between the 5G ProSe Layer-2 UE-to-Network Relay and RAN) is specified in TS 38.XXX.

\* \* \* \* Eleventh change \* \* \* \*

## 5.7 Subscription to 5G ProSe

The subscription information in the UDM contains information to give the user permission to use 5G ProSe.

At any time, the operator can amend or remove the ProSe UE subscription rights from subscription information in the UDM, or to revoke the user's permission to use 5G ProSe.

The following subscription information is defined for 5G ProSe:

- subscription for open 5G ProSe Direct Discovery for NR PC5:

- open 5G ProSe Direct Discovery Model A.

- subscription for restricted 5G ProSe Direct Discovery for NR PC5:

- restricted 5G ProSe Direct Discovery Model A;

- restricted 5G ProSe Direct Discovery Model A with application-controlled extension;

- restricted 5G ProSe Direct Discovery Model A with "on demand" announcing;

- restricted 5G ProSe Direct Discovery Model B.

- subscription for Broadcast, Groupcast and Unicast mode 5G ProSe Direct Communication for NR PC5.

- subscription for 5G ProSe UE acting as 5G ProSe Layer-2 UE-to-Network Relay.

- subscription for 5G ProSe UE acting as 5G ProSe Layer-3 UE-to-Network Relay.

- subscription for 5G ProSe Layer-2 Remote UE access via 5G ProSe Layer-2 UE-to-Network Relay

- subscription for 5G ProSe Layer-3 Remote UE access via 5G ProSe Layer-3 UE-to-Network Relay

- UE-PC5-AMBR for NR PC5.

- PC5 QoS parameters as defined in clause 5.6.1 used by NG-RAN.

- the list of the PLMNs authorized for 5G ProSe services, including:

- the list of the PLMNs where the UE is authorised for open 5G Direct Discovery Model A, i.e. to announce or monitor or both.

- the list of the PLMNs where the UE is authorised for restricted 5G ProSe Direct Discovery Model A, i.e. to announce or monitor or both.

- the list of the PLMNs where the UE is authorised for restricted 5G ProSe Direct Discovery Model B, i.e. to perform Discoverer operation or Discoveree operation or both.

- the list of the PLMNs where the UE is authorised to perform Broadcast, Groupcast and Unicast mode 5G ProSe Direct Communication for NR PC5.

- the list of the PLMNs where the UE is authorised to act as a 5G ProSe Layer-2 UE-to-Network Relay.

- the list of the PLMNs where the UE is authorised to act as a 5G ProSe Layer-3 UE-to-Network Relay.

\* \* \* \* Twelfth change \* \* \* \*

#### 5.8.1.2 Destination Layer-2 ID

Destination Layer-2 ID is defined in clause 5.6.1 of TS 23.287 [2].

The Destination Layer-2 ID for 5G ProSe Direct Discovery with Model A is selected based on the configuration as described in clause 5.1.2.1. The Destination Layer-2 ID for a Solicitation message for Model B is selected based on the configuration as described in clause 5.1.2.1.

For Group member discovery in clause 6.3.2.2, the Layer-2 Group ID is taken as the Destination Layer-2 ID for sending and receiving the Group Member Discovery Announcement message and Group Member Discovery Solicitation message.

#### 5.8.1.3 Source Layer-2 ID

Source Layer-2 ID is defined in clause 5.6.1 of TS 23.287 [2].

The UE self-selects a Source Layer-2 ID for 5G ProSe Direct Discovery and Group member discovery.

\* \* \* \* Thirteenth change \* \* \* \*

#### 5.8.3.1 Common identifiers for 5G ProSe UE-to-Network Relay

The following parameters are used for the 5G ProSe UE-to-Network Relay Discovery Announcement message (Model A), where Source Layer-2 ID and Destination Layer-2 ID are used for sending and receiving the message, and Announcer Info and Relay Service Code are contained in the message:

- Source Layer-2 ID: the 5G ProSe UE-to-Network Relay self-selects a Source Layer-2 ID for 5G ProSe UE-to-Network Relay Discovery, and uses it in the 5G ProSe UE-to-Network Relay Discovery Announcement message.

- Destination Layer-2 ID: the Destination Layer-2 ID for 5G ProSe UE-to-Network Relay Discovery is selected based on the configuration as described in clause 5.1.4.1.

- Announcer Info: provides information about the announcing user.

- Relay Service Code: parameter identifying a connectivity service the 5G ProSe UE-to-Network Relay provides to a 5G ProSe Remote UE. The Relay Service Codes are configured in a 5G ProSe UE-to-Network Relay for advertisement. Additionally, the Relay Service Code may also identifies authorized users the 5G ProSe UE-to-Network Relay would offer service to, and may be used to select the related security policies or information e.g. necessary for authentication and authorization between the 5G ProSe Remote UE and the 5G ProSe UE-to-Network Relay (e.g. a Relay Service Code for relays for police members only would be different than a Relay Service Code for relays for Fire Fighters only, even though potentially they provided connectivity to same DN e.g. to support Internet Access).

The following parameters are used for the 5G ProSe UE-to-Network Relay Discovery Solicitation message (Model B), where Source Layer-2 ID and Destination Layer-2 ID are used for sending and receiving the message, and Discoverer Info and Relay Service Code are contained in the message:

- Source Layer-2 ID: the 5G ProSe Remote-UE self-selects a Source Layer-2 ID for 5G ProSe UE-to-Network Relay Discovery.

- Destination Layer-2 ID: the Destination Layer-2 ID for 5G ProSe UE-to-Network Relay Discovery is selected based on the configuration as described in clause 5.1.4.1.

- Discoverer Info: provides information about the discoverer user.

- Relay Service Code: information about connectivity that the discoverer UE is interested in. The Relay Service Codes are configured in the 5G ProSe Remote UEs interested in related connectivity services.

The following parameters are used in the 5G ProSe UE-to-Network Relay Discovery Response message (Model B), where Source Layer-2 ID and Destination Layer-2 ID are used for sending and receiving the message, and Discoveree Info and Relay Service Code are contained in the message:

- Source Layer-2 ID: the 5G ProSe UE-to-Network Relay self-selects a Source Layer-2 ID for 5G ProSe UE-to-Network Relay Discovery, and uses it in the 5G ProSe UE-to-Network Relay Discovery Response message.

- Destination Layer-2 ID: set to the Source Layer-2 ID of the received 5G ProSe UE-to-Network Relay Discovery Solicitation message.

- Relay Service Code: identifies the connectivity service the 5G ProSe UE-to-Network Relay provides to 5G ProSe Remote UEs that matches the Relay Service Code from the corresponding Discovery Solicitation message.

- Discoveree Info: provides information about the discoveree.

#### 5.8.3.2 Identifiers for 5G ProSe Layer-3 UE-to-Network Relay

The following parameters may be used in addition to the parameters specified in 5.8.3.1, in 5G ProSe Layer-3 UE-to-Network Relay supporting N3IWF discovery procedure (for both Model A and Model B) to assist with N3IWF selection:

- Relay TAI: indicates the Tracking Area Identity corresponding to the serving cell of the 5G ProSe Layer-3 UE-to-Network Relay.

For 5G ProSe Layer-3 UE-to-Network relay, a Relay Service Code in the Announcement Message is associated with a set of PDU session parameters (e.g. PDU Session type, DNN, SSC Mode, S-NSSAI, Access Type Preference). The Relay Service Code may also represent if the relay UE can provide secure N3IWF connection.

For 5G ProSe Layer-3 Remote UE discovering 5G ProSe Layer-3 UE-to-Network relay, the Relay Service Code in the Solicitation Message represents the PDU session parameters that a PDU session of the relay should be able to support. The Relay Service Code may also represent if the remote UE requires secure N3IWF connection.

#### 5.8.3.3 Identifiers for 5G ProSe Layer-2 UE-to-Network Relay

Editor's note: It is FFS what identifiers are used in addition to the identifiers specified in clause 5.8.3.1 for Layer-2 UE-to-Network Relay use case.

Editor's note: It is FFS with what information the RSC is associated for Layer-2 UE-to-Network Relay use case.

\* \* \* \* Fourteenth change \* \* \* \*

#### 6.1.1.6 5G DDNMF – ProSe Application Server

The 5G System architecture supports the service based N67 interface between 5G DDNMF and ProSe Application Server and optionally supports PC2 interface between 5G DDNMF and ProSe Application Server, to enable Proximity Services. See TS 23.501 [4] and TS 23.303 [3].

NOTE: PC2 support between 5G DDNMF and ProSe Application Server is for backwards compatibility for early deployments using Diameter.

##### 6.1.1.7.1 5G ProSe Layer-3 UE-to-Network Relay

The UE-UE protocol stacks for discovery and PC5 link management as defined in clause 6.1.1.2 apply to 5G ProSe Remote UE and 5G ProSe Layer-3 UE-to-Network Relay.

Additionally, when N3IWF is supported by the 5G ProSe Layer-3 UE-to-Network Relay, the following control plane protocol stack apply.



**Legend:**

- NAS, EAP-5G, and IKEv2 between the Remote UE and the N3IWF are defined in TS 23.501 [4] clause 8.2.4.

Figure 6.1.1.7.1-1: Control plane protocol stacks between 5G ProSe Layer-3 Remote UE and N3IWF over 5G ProSe Layer-3 UE-to-Network Relay before the signalling IPSec SA is established



**Legend:**

- NAS, TCP, and IPsec between the Remote UE and the N3IWF are defined in TS 23.501 [4] clause 8.2.4.

Figure 6.1.1.7.1-2: Control plane protocol stacks between 5G ProSe Layer-3 Remote UE and N3IWF over 5G ProSe Layer-3 UE-to-Network Relay after the signalling IPSec SA is established

##### 6.1.1.7.2 5G ProSe Layer-2 UE-to-Network Relay

Figure 6.1.1.7.2-1 illustrates the protocol stack of the NAS connection for the 5G ProSe Layer-2 Remote UE for NAS-MM and NAS-SM. The NAS messages are transparently transferred between the 5G ProSe Layer-2 Remote UE and NG-RAN over the 5G ProSe Layer-2 UE-to-Network Relay using:

- PDCP end-to-end connection between the 5G ProSe Layer-2 Remote UE and NG-RAN, where the role of the 5G ProSe Layer-2 UE-to-Network Relay is to relay the PDUs over the signalling radio bear without any modifications and using the functionality of the adaptation layer as specified in TS 38.XXX [x].

- Connection between NG-RAN and AMF over N2.

- Connection between AMF and SMF over N11.

Editor's note: Whether the adaptation layer is supported over PC5 will be determined by RAN WG2.



Figure 6.1.1.7.2-1: End-to-End Control Plane for a Remote UE using Layer-2 UE-to-Network Relay

The control plane protocol stack used by the 5G ProSe Layer-2 UE-to-Network Relay is defined in clause 8.2.2 of TS 23.501 [4].

##### 6.1.2.2.2 5G ProSe Layer-2 UE-to-Network Relay

Figure 6.1.2.2.2-1 illustrates the protocol stack for the user plane transport, related to a PDU Session, including a 5G ProSe Layer 2 UE-to-Network Relay. The PDU layer corresponds to the PDU carried between the 5G ProSe Layer-2 Remote UE and the Data Network (DN) over the PDU session. The SDAP and PDCP protocols are specified in TS 38.300 [12]. PDCP end-to-end connection is between the 5G ProSe Layer-2 Remote UE and NG-RAN. The functionality of the adaptation layer is specified in TS 38.XXX [x].

Editor's note: Whether the adaptation layer is supported over PC5 will be determined by RAN WG2.



Figure 6.1.2.2.2-1: User Plane Stack for 5G ProSe Layer-2 UE-to-Network Relay

\* \* \* \* Fifteenth change \* \* \* \*

### 6.2.2 PCF based Service Authorization and Provisioning to UE

For PCF based Service Authorization and Provisioning to UE, the Registration procedures as defined in clause 4.2.2.2 of TS 23.502 [5], UE Policy Association Establishment procedure as defined in clause 4.16.11 of TS 23.502 [5] and UE Policy Association Modification procedure as defined in clause 4.16.12 of TS 23.502 [5] apply with the following additions:

- If the UE indicates 5G ProSe Capability in the Registration Request message and if the UE is authorized to use 5G ProSe service based on subscription data, the AMF selects the PCF which supports 5G ProSe Policy/Parameter provisioning as described in clause 6.2.3 and establishes a UE policy association with the PCF for 5G ProSe Policy/Parameter delivery.

- If the UE supports one of 5G ProSe services and it does not have valid 5G ProSe policy/parameters, the UE includes the UE Policy Container with indicating the 5G ProSe Policy Provisioning Request during registration procedure. The UE may also include UE capabilities as defined in clause 4.3.1 in the 5G ProSe Policy Provisioning Request and PCF may determine the ProSe Policy/Parameters for the UE based on received UE capabilities.

- If the UE indicates the 5G ProSe Policy Provisioning Request in the UE Policy Container, the PCF determines whether to provision 5G ProSe Policy/parameters to the UE, as specified in clause 6.1.2.2.2 of TS 23.503 [9], and the PCF provides the 5G ProSe Policy/parameters (see clause 5.1.2.1, clause 5.1.3.1 and clause 5.1.4.1) to the UE by using the procedure as defined in clause 4.2.4.3 "UE Configuration Update procedure for transparent UE Policy Delivery" in TS 23.502 [5].

The PCF may update the 5G ProSe Policy/parameters to the UE in following conditions:

- UE Mobility, e.g. UE moves from one PLMN to another PLMN. This is achieved by using the procedure of UE Policy Association Modification initiated by the AMF, as defined in clause 4.16.12.1 of TS 23.502 [5].

- When there is a subscription change in the list of PLMNs where the UE is authorized to perform 5G ProSe services. This is achieved by using UE Policy Association Modification initiated by the PCF procedure as defined in clause 4.16.12.2 of TS 23.502 [5].

- When there is a change of service specific parameter (including path selection policy) as described in clause 6.2.5 (performing the procedure in clause 4.15.6.7 of TS 23.502 [5]).

- When the timer associated with some Policy/parameter expires.

- When the UE determines that the ProSe Policy/parameter(s) is invalid and performs UE triggered Policy Provisioning procedure to the PCF.

If the serving PLMN is removed from the list of PLMNs in the service authorization parameters, the service authorization is revoked in the UE.

When the UE is roaming, the change of subscription resulting in updates of the service authorization parameters are transferred to the UE by H-PCF via V-PCF.

The UE may perform UE triggered Policy Provisioning procedure to the PCF as specified in clause 6.2.4 when the UE determines the 5G ProSe Policy/Parameter is invalid (e.g. Policy/Parameter is outdated, missing or invalid).

When the UE disables a ProSe capability, the PCF may stop updating the corresponding ProSe Policy/parameter(s) and when the UE enables a ProSe capability the PCF may need to provide or update the corresponding ProSe Policy/parameter(s).

When a 5G ProSe Layer-3 Remote UE is accessing to 5GC via a 5G ProSe Layer-3 UE-to-Network Relay without involving N3IWF, the PCF based provisioning and update of 5G ProSe Policy/parameters to the 5G ProSe Layer-3 Remote UE are not supported.

### 6.2.5 AF-based service parameter provisioning for ProSe over control plane

For 5G ProSe service parameter provisioning (i.e. creating, updating and deleting), the procedure defined in clause 4.15.6.7 of TS 23.502 [5] is performed with the following considerations:

- The AF in TS 23.502 [5] is considered as ProSe Application Server in this specification.

- Service Description indicates 5G ProSe service domain information.

- Service Parameters include parameters for 5G ProSe Direct Discovery and 5G ProSe Direct Communications. The detailed information on the parameters is described in clause 5.1.2.1 and clause 5.1.3.1.

- Service Parameters for 5G ProSe UE-to-Network Relay Discovery and 5G ProSe UE-to-Network Relay Communications. The detailed information on the parameters is described in clause 5.1.4.1.

NOTE: It is assumed that the ProSe service domain information is set based on the Service Level Agreement with the operator.

\* \* \* \* Sixteenth change \* \* \* \*

#### 6.3.2.3 5G ProSe UE-to-Network Relay Discovery

##### 6.3.2.3.1 General

5G ProSe UE-to-Network Relay Discovery is applicable to both 5G ProSe Layer-3 and Layer-2 UE-to-Network relay discovery for public safety use and commercial services. To perform 5G ProSe UE-to-Network Relay Discovery, the 5G ProSe Remote UE and the 5G ProSe UE-to-Network Relay are pre-configured or provisioned with the related information as described in clause 5.1.

In 5G ProSe UE-to-Network Relay Discovery, the UEs use pre-configured or provisioned information for the relay discovery procedures as defined in clause 5.1.4.1.

The Relay Service Code (RSC) is used in the 5G ProSe UE-to-Network Relay discovery, to indicate the connectivity service the 5G ProSe UE-to-Network Relay provides to the 5G ProSe Remote UE. The RSCs are configured on the 5G ProSe UE-to-Network Relay and the 5G ProSe Remote UE as defined in clause 5.1.4. The RSC can also indicate if the 5G ProSe UE-to-Network Relay is a 5G ProSe Layer-3 or Layer-2 UE-to-Network Relay. A 5G ProSe UE-to-Network Relay supporting multiple RSCs can advertise the RSCs using multiple discovery messages, with one RSC per discovery message.

Additional information used for the 5G ProSe UE-to-Network Relay (re)selection and connection maintenance can be advertised using a separate discovery messages of type "Relay Discovery Additional Information". This may include for example the related system information of the 5G ProSe UE-to-Network Relay's serving cell, as defined in TS 38.300 [12].

Both Model A and Model B discovery are supported:

- Model A uses a single discovery protocol message (Announcement).

- Model B uses two discovery protocol messages (Solicitation and Response).

For Relay Discovery Additional Information, only Model A discovery is used.

##### 6.3.2.3.2 Procedure for 5G ProSe UE-to-Network Relay Discovery with Model A

Depicted in Figure 6.3.2.3.2-1 is the procedure for 5G ProSe UE-to-Network Discovery with Model A.



Figure 6.3.2.3.2-1: 5G ProSe UE-to-Network Relay Discovery with Model A

1. The 5G ProSe UE-to-Network Relay sends a UE-to-Network Relay Discovery Announcement message. The UE-to-Network Relay Discovery Announcement message contains Announcer Info and RSC, and is sent using the Source Layer-2 ID and Destination Layer-2 ID as described in clause 5.8.3.

For 5G ProSe Layer-3 UE-to-Network Relay, the 5G ProSe Layer-3 UE-to-Network Relay shall only include a RSC in the UE-to-Network Relay Discovery Announcement when the S-NSSAI associated with that RSC belongs to the Allowed NSSAI of the UE-to-Network Relay.

The 5G ProSe Remote UE (1 to 3) determines the Destination Layer-2 ID for signalling reception. The Destination Layer-2 ID is configured with the UE(s) as specified in clause 5.1.4.1.

5G ProSe Remote UE (1 to 3) monitors announcement messages with the 5G ProSe UE-to-Network RSC corresponding to the desired services.

Optionally, the 5G ProSe UE-to-Network Relay may also send UE-to-Network Relay Discovery Additional Information messages. The parameters contained in this message are described in clause 5.8.3.

##### 6.3.2.3.3 Procedure for 5G ProSe UE-to-Network Relay Discovery with Model B

Depicted in Figure 6.3.2.3.3-1 is the procedure for 5G ProSe UE-to-Network Relay Discovery with Model B.



Figure 6.3.2.3.3-1: 5G ProSe UE-to-Network Relay Discovery with Model B

1. The 5G ProSe Remote UE sends a 5G ProSe UE-to-Network Relay Discovery Solicitation message. The 5G ProSe UE-to-Network Discovery Solicitation message contains Discoverer Info and RSC, and is send using the Source Layer-2 ID and Destination Layer-2 ID as described in clause 5.8.3. The 5G ProSe Remote UE discovering a 5G ProSe UE-to-Network Relay sends a solicitation message with the RSC which is associated to the desired connectivity service.

How the 5G ProSe UE-to-Network Relays (1 to 3) determine the Destination Layer-2 ID for signalling reception is specified in clause 5.8.3. The Destination Layer-2 ID is configured with the UE(s) as specified in clause 5.1.4.1.

2. The 5G ProSe UE-to-Network Relays (1 and 2) that match the values of the RSC contained in the solicitation message respond to the 5G ProSe Remote UE with a UE-to-Network Relay Discovery Response message. The 5G ProSe UE-to-Network Relay Discovery Response message contains Discoveree Info and RSC, and is sent using the Source Layer-2 ID and Destination Layer-2 ID as described in clause 5.8.3.

For 5G ProSe Layer-3 UE-to-Network Relay, the 5G ProSe UE-to-Network Relay shall only respond to a matching RSC in the UE-to-Network Relay Discovery Solicitation message when the S-NSSAI associated with that RSC belongs to the Allowed NSSAI of the 5G ProSe UE-to-Network Relay.

The 5G ProSe Remote UE selects the 5G ProSe UE-to-Network Relay based on the information received in step 2.

\* \* \* \* Seventeenth change \* \* \* \*

## 6.5 5G ProSe UE-to-Network Relay Communication

### 6.5.1 5G ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay

#### 6.5.1.1 5G ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay without N3IWF

A 5G ProSe Layer-3 UE-to-Network Relay registers to the network (if not already registered). 5G ProSe Layer-3 UE-to-Network Relay establishes a PDU Session(s) or modifies an existing PDU Session(s) in order to provide relay traffic towards 5G ProSe Layer-3 Remote UE(s). PDU Session(s) supporting 5G ProSe Layer-3 UE-to-Network Relay shall only be used for 5G ProSe Layer-3 Remote UE(s) relay traffic.

The PLMN serving the 5G ProSe Layer-3 UE-to-Network Relay and the PLMN to which the 5G ProSe Layer-3 Remote UE registers can be the same PLMN or two different PLMNs.



Figure 6.5.1.1-1: 5G ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay without N3IWF

1. Service authorization and provisioning are performed for the 5G ProSe Layer-3 UE-to-Network Relay (step 1a) and 5G ProSe Layer-3 Remote UE (step 1b) as described in clause 6.2.

2. The 5G ProSe Layer-3 UE-to-Network Relay may establish a PDU Session for relaying. In case of IPv6, the 5G ProSe Layer-3 UE-to-Network Relay obtains the IPv6 prefix via prefix delegation function from the network as defined in TS 23.501 [4].

NOTE 1: 5G ProSe Layer-3 UE-to-Network Relay can establish a PDU Session for any Relay Service Code it supports before the connection is established with the 5G ProSe Layer-3 Remote UE.

3. The 5G ProSe Layer-3 Remote UE performs discovery of a 5G ProSe Layer-3 UE-to-Network Relay as described in clause 6.3.2.3. As part of the discovery procedure the 5G ProSe Layer-3 Remote UE learns about the connectivity service the 5G ProSe Layer-3 UE-to-Network Relay provides.

4. The 5G ProSe Layer-3 Remote UE selects a 5G ProSe Layer-3 UE-to-Network Relay and establishes a connection for unicast mode communication as described in clause 6.4.3.1. If there is no PDU Session associated with the Relay Service Code or a new PDU Session for relaying is needed, the 5G ProSe Layer-3 UE-to-Network Relay initiates a new PDU Session establishment procedure for relaying before completing the PC5 connection establishment.

The 5G ProSe Layer-3 UE-to-Network Relay determines the PDU Session type for relaying as specified in clause 5.4.1.1.

According to the PDU Session Type for relaying, the 5G ProSe Layer-3 UE-to-Network Relay performs relaying function at the corresponding layer as follows:

- When the IP type PDU Session is used for IP traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay acts as an IP router. For IPv4, the 5G ProSe Layer-3 UE-to-Network Relay performs IPv4 NAT between IPv4 addresses assigned to the 5G ProSe Layer-3 Remote UE and the IPv4 address assigned to the PDU Session used for the relay traffic.

- When the Ethernet type PDU Session is used for Ethernet traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay acts as an Ethernet switch.

- When the Unstructured type PDU Session is used for Unstructured traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay performs traffic relaying based on a mapping between the PC5 Link Identifier and the PDU Session ID, and a mapping between PFI for PC5 Layer-2 link and the QFI for the PDU Session. These mappings are created when the Unstructured type PDU Session is established for the 5G ProSe Layer-3 Remote UE.

- When the IP type PDU Session is used for Ethernet or Unstructured traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay uses IP tunneling. For this IP tunnelling, the 5G ProSe Layer-3 UE-to-Network Relay locally assigns an IP address/prefix for the 5G ProSe Layer-3 Remote UE and uses it on the Uu reference point to encapsulate and decapsulate the uplink and downlink traffic for the 5G ProSe Layer-3 Remote UE. The tunnelled traffic over Uu reference point is transported over the PC5 reference point as Ethernet or Unstructured traffic.

5. For IP PDU Session Type and IP traffic over PC5 reference point, IPv6 prefix or IPv4 address (including NAT case) is allocated for the 5G ProSe Layer-3 Remote UE as defined in clause 5.5.

6. The 5G ProSe Layer-3 Remote UE may provide the PC5 QoS rule to the 5G ProSe Layer-3 UE-to-Network Relay using Layer-2 link modification procedure as specified in clause 6.4.3.4. The 5G ProSe Layer-3 UE-to-Network Relay generates the Packet Filters used over Uu interface based on the received PC5 QoS Rule(s) as described in clause 5.6.2.1, and may perform the UE requested PDU Session Modification as defined in TS 23.502 [5] clause 4.3.3 to setup a new QoS Flow or bind the traffic to an existing QoS Flow.

From this point the uplink and downlink relaying can start. For downlink traffic forwarding, the PC5 QoS Rule is used to map the downlink packet to the PC5 QoS Flow. For uplink traffic forwarding, the 5G QoS Rule is used to map the uplink packet to the Uu QoS Flow.

7. The 5G ProSe Layer-3 UE-to-Network Relay shall send a Remote UE Report (Remote User ID, Remote UE info) message to the SMF for the PDU Session associated with the relay. The Remote User ID is an identity of the 5G ProSe Layer-3 Remote UE user (provided via User Info) that was successfully connected in step 4. The Remote UE info is used to assist identifying the 5G ProSe Layer-3 Remote UE in the 5GC. For IP PDU Session Type, the Remote UE info is Remote UE IP info. For Ethernet PDU Session Type, the Remote UE info is Remote UE MAC address which is detected by the 5G ProSe Layer-3 UE-to-Network Relay. For Unstructured PDU Session Type, the Remote UE info is not included. The SMF stores the Remote User IDs and the related Remote UE info in the 5G ProSe Layer-3 UE-to-Network Relay's SM context for this PDU Session associated with the relay.

The Remote UE Report is N1 SM NAS message sent with the PDU Session ID to the AMF, in turn delivered to the SMF.

NOTE 2: The privacy protection for Remote User ID depends on SA WG3 design.

For IP info the following principles apply:

- for IPv4, the 5G ProSe Layer-3 UE-to-Network Relay shall report TCP/UDP port ranges assigned to individual 5G ProSe Layer-3 Remote UE(s) (along with the Remote User ID);

- for IPv6, the 5G ProSe Layer-3 UE-to-Network Relay shall report IPv6 prefix(es) assigned to individual 5G ProSe Layer-3 Remote UE(s) (along with the Remote User ID).

The 5G ProSe Layer-3 UE-to-Network Relay shall send the Remote UE Report message when the 5G ProSe Layer-3 Remote UE disconnects from the 5G ProSe Layer-3 UE-to-Network Relay (e.g. upon explicit layer-2 link release or based on the absence of keep alive messages over PC5) to inform the SMF that the 5G ProSe Layer-3 Remote UE(s) have left.

NOTE 3: In order for the SMF to have the 5G ProSe Layer-3 Remote UE(s) information, the HPLMN and the VPLMN where the 5G ProSe Layer-3 UE-to-Network Relay is authorised to operate, needs to support the transfer of the 5G ProSe Layer-3 Remote UE related parameters if the SMF is in the HPLMN.

It is up to 5G ProSe Layer-3 UE-to-Network Relay implementation how PDU Session(s) used for relaying are released or QoS Flow(s) used for relaying are removed by the 5G ProSe Layer-3 UE-to-Network Relay when 5G ProSe Layer-3 Remote UE(s) disconnect from the 5G ProSe Layer-3 UE-to-Network Relay.

#### 6.5.1.2 5G ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

##### 6.5.1.2.1 Connection management via 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

In order to relay 5G ProSe Layer-3 Remote UE's traffic via N3IWF, the 5G ProSe Layer-3 UE-to-Network Relay needs suitable ProSe Policies configured for establishing a PDU Session associated with a UPF that conveys the traffic towards the N3IWF.5G ProSe Layer-3 UE-to-Network Relay registers to the network as specified in clause 6.5.1.1. Based on configuration and authorization, the 5G ProSe Layer-3 UE-to-Network Relay is provisioned with PDU Session parameters in the ProSe Policy allowing the access to the N3IWF. When the corresponding PDU Session is established, the 5GS, e.g. SMF, based on the parameters (i.e. DNN, S-NSSAI) selects the UPF that ensures the connection to the N3IWF. The UPF for the 5G ProSe UE-to-Network Relay and the N3IWF may be collocated.

A 5G ProSe Layer-3 UE-to-Network Relay with a PDU Session providing access via N3IWF may also have other PDU Sessions for supporting access from the 5G ProSe Layer-3 Remote UE without going through a N3IWF. Different PDU Sessions need to be established to serve such traffic.

As an option, based on configurations, the 5G ProSe Layer-3 UE-to-Network Relay may also use different PDU Sessions for signalling traffic (e.g. IKE signalling) between 5G ProSe Layer-3 Remote UE and the N3IWF and the user plane traffic of the 5G ProSe Layer-3 Remote UE via N3IWF.



Figure 6.5.1.2.1-1: Connection establishment over 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support

1. 5G ProSe Layer-3 UE-to-Network Relay performs Registration procedures and obtains the ProSe Policy that corresponds to the operation supporting the access to N3IWF. The ProSe Policy includes the RSC and PDU Session parameters allowing the access to the N3IWF.

The 5G ProSe Layer-3 Remote UE is configured with the corresponding ProSe Policy and URSP rules. The URSP policy indicates if a particular service needs to be accessed within a PDU Session and thus should use a 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support as described in clause 6.5.4. When the 5G ProSe Layer-3 Remote UE is in coverage, it may register to the 5GS and establish the PDU Sessions via the Direct Network Communication path.

2-4. A 5G ProSe Layer-3 UE-to-Network Relay and 5G ProSe Layer-3 Remote UE follow the procedures described in steps 3-5 in clause 6.5.1.1 using the RSC configured for making the 5G ProSe Layer-3 Remote UE access to 5GC via N3IWF.

NOTE: The services requiring the access via N3IWF can be configured with the RSC(s) that can be served by the same 5G ProSe UE-to-Network Relay.

5. The 5G ProSe Layer-3 Remote UE that connects to a 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support selects an N3IWF and determines the N3IWF IP address. The 5G ProSe Layer-3 Remote UE follows the N3IWF selection procedure as described in clause 6.5.1.2.2.

6. The 5G ProSe Layer-3 Remote UE establishes a signalling IPsec tunnel using IKE procedures with a N3IWF and performs NAS Registration as shown in Figure 4.12.2.2-1 of TS 23.502 [5]. After the IPSec tunnel is established, the 5G ProSe Layer-3 Remote UE can perform any of the NAS procedures (incl. PDU Session establishment for the 5G ProSe Layer-3 UE-to-Network Relay PDU Sessions) as specified in clause 4.12 of TS 23.502 [5].

IKE keep alive(s) between the 5G ProSe Layer-3 Remote UE and the N3IWF are used for detecting possible path failure. The 5G ProSe Layer-3 Remote UE may change 5G ProSe Layer-3 UE-to-Network Relay(s) while maintain the session with the N3IWF when the 5G ProSe Layer-3 Remote UE and the N3IWF support MOBIKE. This is negotiated between the 5G ProSe Layer-3 Remote UE and the N3IWF as specified in TS 23.502 [5], clause 4.12.2.2). When IKE keep alive(s) are used, the 5G ProSe Layer-3 Remote UE needs to keep the PC5 connection and 5G ProSe Layer-3 UE-to-Network Relay keeps the PDU Session.

##### 6.5.1.2.2 N3IWF selection procedure

When the 5G ProSe Layer-3 Remote UE relays traffic over 5G ProSe Layer-3 UE-to-Network Relay that supports N3IWF, the 5G ProSe Layer-3 Remote UE selects the N3IWF using the N3IWF identifier configuration procedure that is specified in clause 6.3.6 of TS 23.501 [4] for untrusted non-3GPP access with the below additional procedures.

To support the N3IWF selection, a 5G ProSe Layer-3 Remote UE is configured by HPLMN with following information:

1. N3IWF identifier configuration (either FQDN or IP address) in the HPLMN.

2. 5G ProSe Layer-3 UE-to-Network Relay access node selection information - a prioritized list of PLMNs for N3IWF selection. It also indicates if selection of an N3IWF in a PLMN should be based on Tracking Area Identity FQDN or on Operator Identifier FQDN.

When the 5G ProSe Layer-3 Remote UE decides to select an N3IWF in the HPLMN, the 5G ProSe Layer-3 Remote UE uses the N3IWF identifier configuration, if configured, to find the IP address of the N3IWF in the HPLMN. Otherwise, 5G ProSe Layer-3 Remote UE constructs N3IWF FQDN based on either the Tracking Area Identity FQDN or on Operator Identifier FQDN of the 5G ProSe Layer-3 UE-to-Network Relay node selection information.

To assist the 5G ProSe Layer-3 Remote UE with N3IWF selection, the 5G ProSe Layer-3 UE-to-Network Relay supporting N3IWF access advertises the 5GS TAI corresponding to the serving cell, as defined in clause 5.8.3, in the 5G ProSe UE-to-Network Relay Discovery procedure as defined in clause 6.3.2.3.

A 5G ProSe Layer-3 Remote UE constructs the FQDN using either Tracking Area Identity FQDN or on Operator Identifier FQDN and selects the N3IWF using the procedures of N3IWF selection in clause 6.3.6 of TS 23.501 [4].

N3IWF identifier configuration and the 5G ProSe Layer-3 UE-to-Network Relay access node selection information are provided to the 5G ProSe Layer-3 Remote UE in the ProSe Policy.

##### 6.5.1.2.3 Mobility of 5G ProSe Layer-3 Remote UE between Direct and Indirect Network communication path

When 5G ProSe Layer-3 Remote UE changes from Direct Network Communication to Indirect Network Communication path, TS 23.502 [5] clause 4.9.2.2 applies after the 5G ProSe Layer-3 Remote UE establishes PC5 connection to the 5G Layer-3 UE-to-Network Relay.

When 5G ProSe Layer-3 Remote UE changes from Indirect Network Communication path to Direct Network Communication, the 5G ProSe Layer-3 Remote UE follows TS 23.502 [5] clause 4.9.2.1.

Editor's note: The mobility procedure to switch Indirect Network Communication path from one Layer-3 UE-to-Network Relay to another is FFS.

### 6.5.2 5G ProSe Communication via 5G ProSe Layer-2 UE-to-Network Relay

#### 6.5.2.1 Registration and Connection Management

##### 6.5.2.1.1 Registration Management

Registration Management for the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 UE-to-Network Relay follows the principles and procedures defined in TS 23.501 [4] and TS 23.502 [5]. The 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 UE-to-Network Relay may be served by the same AMF or different AMFs.

##### 6.5.2.1.2 Connection Management

Connection Management for the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2 UE-to-Network Relay follows the principles and procedures defined in TS 23.501 [4] and TS 23.502 [5] with the following modifications.

The 5G ProSe Layer-2 UE-to-Network Relay may only relay data/signalling for the 5G ProSe Layer-2 Remote UE(s) when the 5G ProSe Layer-2 UE-to-Network Relay is in CM-CONNECTED state. If the 5G ProSe Layer-2 UE-to-Network Relay is in CM\_IDLE state and receives a connection request from the 5G ProSe Layer-2 Remote UE for relaying, the 5G ProSe Layer-2 UE-to-Network Relay shall trigger Service Request procedure to enter CM\_CONNECTED state before relaying the 5G ProSe Layer-2 Remote UEs traffic.

- If any 5G ProSe Layer-2 Remote UE connected to the 5G ProSe Layer-2 UE-to-Network Relay is in CM-CONNECTED, the 5G ProSe Layer-2 UE-to-Network Relay should remain CM-CONNECTED state.

- If all 5G ProSe Layer-2 Remote UEs connected to the 5G ProSe Layer-2 UE-to-Network Relay enter CM-IDLE, the 5G ProSe Layer-2 UE-to-Network Relay may enter CM-IDLE state.

Editor's note: The state handling may need updating once the AS layer aspects are defined.

When 5G ProSe Layer-2 Remote UE is CM-IDLE or CM-CONNECTED, the 5G ProSe Layer-2 UE-to-Network Relay and 5G ProSe Layer-2 Remote UE keep the PC5 link.

For paging a 5G ProSe Layer-2 Remote UE, it follows the principles and procedures defined in TS 23.501 [4] and TS 23.502 [5], and the paging message delivery from NG-RAN to 5G ProSe Layer-2 Remote UE is specified in TS 38.XXX [x].

#### 6.5.2.2 Connection establishment



Figure 6.5.2.1-1: Connection Establishment for 5G ProSe Layer-2 UE-to-Network Relay

0. If in coverage, the 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay may independently perform the initial registration to the network according to registration procedures in TS 23.502 [5].

1. If in coverage, the 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay independently get the service authorization for 5G ProSe Layer-2 UE-to-Network Relay operation from the network. Service authorization and parameters provisioning for 5G ProSe Layer-2 UE-to-Network Relay operation are performed for the 5G ProSe Layer-2 UE-to-Network Relay and 5G ProSe Layer-2 Remote UE as specified in clause 5.1.4.

If the 5G ProSe Layer-2 Remote UE is not in coverage, the pre-configured parameters are used, and the service authorization and parameters may be updated after step 6.

If the 5G ProSe Layer-2 Remote UE has not performed Initial Registration, the 5G ProSe Layer-2 Remote UE may perform the Initial Registration in step 6.

2. The 5G ProSe Layer-2 Remote UE and 5G ProSe Layer-2 UE-to-Network Relay perform 5G ProSe UE-to-Network Relay Discovery and selection, as specified in clause 6.3.2.3.

3. The 5G ProSe Layer-2 Remote UE initiates a one-to-one communication connection with the selected 5G ProSe Layer-2 UE-to-Network Relay over PC5 using the procedure as described in clause 6.4.3.

4. If the 5G ProSe Layer-2 UE-to-Network Relay is in CM\_IDLE state, triggered by the request received from the 5G ProSe Layer-2 Remote UE, the 5G ProSe Layer-2 UE-to-Network Relay performs Service Request procedure in the clause 4.2.3.2 of TS 23.502 [5].

Editor's note: How the ProSe UE-to-Network Relay is triggered to perform Service Request procedure requires cooperation with RAN2.

5. The 5G ProSe Layer-2 Remote UE establishes an RRC Connection with the same NG-RAN serving the selected 5G ProSe Layer-2 UE-to-Network Relay, specified in TS 38.XXX [x].

6. The 5G ProSe Layer-2 Remote UE sends a NAS message to the serving AMF. The NAS message is encapsulated in an Uu RRC message that is sent over PC5 to the 5G ProSe Layer-2 UE-to-Network Relay, and the 5G ProSe Layer-2 UE-to-Network Relay forwards the Uu RRC message to the NG-RAN specified in TS 38.XXX. NG-RAN selects the 5G ProSe Layer-2 Remote UE's serving AMF and forwards the NAS message to this AMF.

If 5G ProSe Layer-2 Remote UE has not performed the initial registration, the NAS message is an initial Registration message. Otherwise, the NAS message is either a service request message, or a mobility or periodic Registration message.

7. The 5G ProSe Layer-2 Remote UE may trigger the PDU Session Establishment procedure as defined in clause 4.3.2.2 of TS 23.502 [5].

8. The data is transferred between the 5G ProSe Layer-2 Remote UE and UPF via the 5G ProSe Layer-2 UE-to-Network Relay and NG-RAN. The 5G ProSe Layer-2 UE-to-Network Relay forwards all the data messages between the 5G ProSe Layer-2 Remote UE and NG-RAN, as specified in TS 38.XXX [x].

### 6.5.3 5G ProSe UE-to-Network Relay reselection

After being connected to the 5G ProSe UE-to-Network Relay, the 5G ProSe Remote UE keeps performing the measurement of the signal strength of PC5 unicast link with the 5G ProSe UE-to-Network Relay for relay reselection.

Editor's note: The measurement of the signal strength of PC5 unicast link with the 5G ProSe UE-to-Network Relay for relay reselection can be updated and refined based on RAN2 decision or specification.

### 6.5.4 5G ProSe Remote UE traffic handling for 5G ProSe UE-to-Network Relay support

For the 5G ProSe Remote UE to access the service via 5G ProSe UE-to-Network Relay, the following apply:

- The application traffic on the 5G ProSe Remote UE is managed by URSP rules (with consideration of local configurations), following the procedure defined in clause 6.1.2.2.1 and 6.6.2.3 of TS 23.503 [9]. The URSP rules defined in clause 6.6.2.1 of TS 23.503 [9] applies for the 5G ProSe Remote UE, with RSD enhanced to include:

- a new "5G ProSe Layer 3 UE-to-Network Relay Offload indication".

- If an application or application traffic matches a URSP rule, corresponding RSDs shall be used to evaluate the existing PDU sessions, or establish a new PDU session, or determine to offload outside of a PDU session.

- If the selected RSD contains "5G ProSe Layer 3 UE-to-Network Relay Offload indication", the 5G ProSe Remote UE will route the traffic to the 5G ProSe Layer-3 UE-to-Network Relay connection without establishing a PDU session, when such connection is available.

This may trigger the 5G ProSe Remote UE to start 5G ProSe UE-to-Network Relay discovery if it is not yet started. The discovery and establishment of the connection with the 5G ProSe Layer-3 UE-to-Network Relay is controlled by the ProSe Policy (pre-) configured on the 5G ProSe Remote UE.

- If the matched URSP rule contains both a RSD with ''Non-Seamless Offload indication" and a RSD with " 5G ProSe Layer 3 UE-to-Network Relay Offload indication", whether to offload the traffic to non-3GPP access or the 5G ProSe Layer-3 UE-to-Network Relay connection depends on the priority of the RSDs, and the availability of the connections, as specified in the clause 6.6.2.3 of TS 23.503 [9].

- If the selected RSD does not contain the " 5G ProSe Layer 3 UE-to-Network Relay Offload indication" or, "Non-Seamless Offload indication", the 5G ProSe Remote UE shall use a PDU session to route the corresponding application traffic.

If configured in the ProSe Policy, the 5G ProSe Remote UE may attempt the discovery of a Relay Service Code corresponds to 5G ProSe Layer-3 UE-to-Network Relay with N3IWF support in the discovery procedure.

- If the 5G ProSe Remote UE has a 5G ProSe UE-to-Network Relay connection available, it will be treated as the "3GPP" access type. The URSP handling as defined in TS 23.503 [9] applies. The selection between the direct Uu connection and the indirect connection via a 5G ProSe UE-to-Network Relay is controlled by the ProSe Policy.

For the 5G ProSe Layer-3 UE-to-Network Relay and 5G ProSe Layer-2 UE-to-Network Relay, the URSP handling does not apply to the relayed traffic from the 5G ProSe Remote UE.

For the 5G ProSe Layer-3 UE-to-Network Relay, the PDU session established for relaying the 5G ProSe Remote UE's traffic is controlled by the ProSe Policy.

\* \* \* \* Eighteenth change \* \* \* \*

### 6.6.2 Registration procedure

The Registration procedure for UE is performed as defined in TS 23.502 [5] clause 4.2.2.2 with the following additions:

- The UE includes the 5G ProSe Capability as part of the "5GMM capability" in the Registration Request message. The AMF stores the 5G ProSe Capability for 5G ProSe operation and forwards it to PCF. The 5G ProSe Capability indicates whether the UE supports one or more of the following ProSe capabilities: 5G ProSe Direct Discovery, 5G ProSe Direct Communication, 5G ProSe Layer-2 UE-to-Network Relay, 5G ProSe Layer-3 UE-to-Network Relay, 5G ProSe Layer-2 Remote UE, and 5G ProSe Layer-3 Remote UE).

- The AMF obtains the 5G ProSe subscription data as part of the user subscription data from UDM during UE Registration procedure using Nudm\_SDM service as defined in clause 4.2.2.2.2 of TS 23.502 [5].

- The AMF determines whether the UE is authorised to use 5G ProSe services based on UE's 5G ProSe Capability and the ProSe Service Authorisation included in the subscription data received from UDM as specified in clause 5.7. ProSe NR UE-PC5-AMBR is also provided to the AMF as part of the subscription data for 5G ProSe services.

- Based on the received 5G ProSe Capability, the PCF provides the PC5 QoS parameters for 5G ProSe to AMF. The AMF stores such information as part of the UE context.

- If the UE is authorised to use 5G ProSe services, then the AMF shall include in a NGAP message sent to NG-RAN:

- "5G ProSe authorised" information, including one or more of the following 5G ProSe services:

- whether the UE is authorized to use 5G ProSe Direct Discovery;

- whether the UE is authorized to use 5G ProSe Direct Communication;

- whether the UE is authorized to act as a 5G ProSe Layer-2 UE-to-Network Relay;

- whether the UE is authorized to act as a 5G ProSe Layer-3 UE-to-Network Relay;

- whether the UE is authorized to act as a 5G ProSe Layer-2 Remote UE.

- ProSe NR UE-PC5-AMBR, used by NG-RAN for the resource management of UE's PC5 transmission for 5G ProSe services in network scheduled mode.

- the PC5 QoS parameters for 5G ProSe used by the NG-RAN for the resource management of UE's PC5 transmission for ProSe services in network scheduled mode.

- If the UE is authorised to use 5G ProSe services, then the AMF should not initiate the release of the signalling connection after the completion of the Registration procedure. The release of the signalling connection relies on the decision of NG-RAN, as specified in TS 23.502 [5].

\* \* \* \* End of changes \* \* \* \*