**3GPP TSG-WG SA2 Meeting #164S2-2409080**

**Maastricht, NL, 19th Aug – 23rd Aug, 2024 (revision of S2-2407651)**

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| --- |
| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **23.304** | **CR** | **0451** | **rev** | **1** | **Current version:** | **19.0.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps | **X** | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  | Support ProSe U2N Multihop Relay |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon, Samsung, Interdigital, CATT, KPN N.V. Nokia, Nokia Shanghai Bell, China Telecom,  |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | 5G ProSe\_Ph3 |  | ***Date:*** | 2024-08-22 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | TR 23.700-03 has conclusion that multihop U2N relay will be supported. Therefore, TS 23.304 shall be updated according to the conclusion of TR 23.700-03. |
|  |  |
| ***Summary of change:*** | * Update the identifiers for multi-hop U2N Discovery with Model B.
* New clause for multi-hop UE-to-Network Relay discovery with Model B.
* New clause for Layer-2 link management over PC5 reference point for multi-hop Layer-3 UE-to-Network Relay after Model B Discovery with and without N3IWF support.
* New clause for 5G ProSe Communication via Multi-hop 5G ProSe Layer-3 UE-to-Network Relay after Model B Discovery.
 |
|  |  |
| ***Consequences if not approved:*** | U2N multihop relay feature will not be supported. |
|  |  |
| ***Clauses affected:*** | 6.1.1.7.1, 6.1.2.3.1, 5.8.3.1, 6.3.2.3.X(new), 6.4.3.X(new), 6.5.1.X(new), 6.5.1.Y(new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

##### 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, 5G ProSe Intermediate UE-to-Network Relay and 5G ProSe Layer-3 UE-to-Network Relay. There could be zero, one or multiple 5G ProSe Intermediate UE-to-Network Relay(s) between the 5G ProSe Remote UE and 5G ProSe UE-to-Network Relay. If there is no 5G ProSe Intermediate UE-to-Network Relay, the IP connection and PC5 link is between the 5G ProSe Remote UE and 5G ProSe 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.

EAP-5G

NAS

IP

PC5

IKEv2

EAP-5G

IP

PC5

Remote UE

Intermediate U2N Relay(s)

PC5

U2N Relay

IP

Uu

Uu

RAN

N3 Stack

.

Relay

N3

stack

U2N Relay UPF

L2/L1

IP

PC5

PC5

Uu

N3

N6

Lower Layers

IP

N3IWF

N2

Stack

.

Relay

NAS

N2

N2

Stack

AMF

IKEv2

**Legend:**

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

NAS

IP

PC5

IPSec

(tunnel mode)

Inner IP

TCP

IP

PC5

Remote UE

Intermediate U2N Relay(s)

PC5

U2N Relay

IP

Uu

Uu

RAN

N3 Stack

.

Relay

N3

stack

U2N Relay UPF

L2/L1

IP

PC5

PC5

Uu

N3

N6

Lower Layers

IP

N3IWF

IPSec

(tunnel mode)

Inner IP

TCP

N2

Stack

.

Relay

NAS

N2

N2

Stack

AMF

**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

\* \* \* \* Next change \* \* \* \*

##### 6.1.2.3.1 5G ProSe Layer-3 UE-to-Network Relay



**Legend:**

- GPRS Tunnelling Protocol for the user plane (GTP‑U): This protocol tunnels user data between NG-RAN node and UPF as well as between the UPFs in the backbone network (not shown in the figure). GTP-U shall encapsulate all end user PDU packets.

- SMF controls the user plane tunnel establishment and establishes User Plane Bearers between NG-RAN node and UPF.

- UDP/IP: These are the backbone network protocols used for routing user data and control signalling.

- Uu: The NR Uu radio protocols of NG-RAN between the UE-to-Network Relay and the NG-RAN node are specified in TS 38.300 [12].

- PC5-U: The radio protocols between the UE and the UE-to-Network Relay are specified in clause 6.1.2.2.

Figure 6.1.2.3.1-1: User plane protocol stack for Layer-3 UE-to-Network Relay

PDU Layer

IP

PC5

IPSec

(tunnel mode)

Inner IP

GRE

IP

PC5

Remote UE

Intermediate U2N Relay(s)

PC5

U2N Relay

IP

Uu

Uu

RAN

N3 Stack

.

Relay

N3

stack

U2N Relay UPF

L2/L1

IP

PC5

PC5

Uu

N3

N6

Lower Layers

IP

N3IWF

IPSec

(tunnel mode)

Inner IP

GRE

N3

Stack

.

Relay

PDU Layer

N3

Stack

N9

Stack

.

Relay

N3

N9

N9

Stack

UPF(PSA)

**Legend:**

- IPSec, Inner IP and GRE between the UE and the N3IWF are defined in TS 23.501 [4] clause 8.3.2.

Figure 6.1.2.3.1-2: User plane protocol stacks for Layer-3 UE-to-Network Relay with N3IWF support

There may be zero, one or multiple 5G ProSe Intermediate UE-to-Network Relay(s) between the 5G ProSe Remote UE and 5G ProSe UE-to-Network Relay. If there is no 5G ProSe Intermediate UE-to-Network Relay, the IP connection and PC5 link is between the 5G ProSe Remote UE and 5G ProSe UE-to-Network Relay.

\* \* \* \* Next 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.

- 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 (i.e. User Info ID) 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 (i.e. User Info ID) about the discoverer user.

- Target Info: provides information (i.e. User Info ID) about the targeted discoveree 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.

To support Multi-hop 5G ProSe UE-to-Network Relay discovery the following parameters may be added :

- (Optional) Hop count: indicates the number of hops that the message is already relayed. It will be increased by 1 per hop.

- (Optional) Hop-Limit: a unmodified value that indicates the hop limit of the message. It is set by the 5G ProSe Remote UE, to a value smaller than the (pre)configured maximum number of hops as defined in clause 5.1.4.1a.

- Path information: an (ordered) list of User Info ID of Intermediate UE-to-Network Relays that indicates the transmitted path of the message.

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.

- 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 (i.e. User Info ID) about the discoveree.

To support Multi-hop 5G ProSe UE-to-Network Relay discovery the following parameters may be added :

- (Optional) Hop count: indicates the number of hops between the 5G ProSe Remote UE and the 5G ProSe UE-to-Network Relay on the path selected by the the 5G ProSe UE-to-Network Relay.

- Path information: an (ordered) list of User Info ID of Intermediate UE-to-Network Relays on the path selected by the the 5G ProSe UE-to-Network Relay.

The following parameters may be used in the Relay Discovery Additional Information message (using Model A) based on the procedure defined in clause 6.5.1.3 for 5G ProSe UE-to-Network Relay where Source Layer-2 ID and Destination Layer-2 ID are used for sending and receiving the message and the other parameters are contained in the message:

- Source Layer-2 ID: the 5G ProSe UE-to-Network Relay self-selects a Source Layer-2 ID to send the Relay Discovery Additional Information message.

- Destination Layer-2 ID: the Destination Layer-2 ID to send the Relay Discovery Additional Information message is selected based on the configuration as described in clause 5.1.4.1.

- Relay Service Code: the Relay Service Code associated with the message. The Relay Service Code is used to identify the security parameters needed by the receiving UE to process the discovery message.

- Announcer Info: provides information about the announcing user.

- Additional parameters: the additional parameters for 5G ProSe Layer-3 UE-to-Network Relay (when applicable) are defined in clause 5.8.3.2.

NOTE 1: The UE implementation needs to ensure that when the UE self-selects Source Layer-2 IDs, the self-selected Source Layer-2 IDs are different between 5G ProSe Direct Discovery (including 5G ProSe UE-to-Network Relay Discovery) in clause 6.3.2 and 5G ProSe Direct Communication (including 5G ProSe UE-to-Network Relay Communication) in clause 6.4 and are different from any other provisioned Destination Layer-2 IDs as described in clause 5.1 and any other self-selected Source Layer-2 IDs used in a simultaneous 5G ProSe Direct Discovery (including 5G ProSe UE-to-Network Relay Discovery) with a different discovery model.

NOTE 2: If a 5G ProSe UE-to-Network Relay and 5G ProSe Remote UE from different PLMNs discover each other, it means that the Relay Service Code is associated with the same connectivity service, and the same Relay Service Code is provisioned based on Service Level Agreement among PLMNs.

NOTE 3: The Hop count, Hop-Limit and Path information are used for multi-hop 5G ProSe UE-to-Network Relay Discovery with Model B. The multi-hop UE-to-Network Discovery message has no impact on 5G ProSe UE-to-Network Relay or 5G ProSe Remote UE that only supports single-hop UE-to-Network Relay.Single-hop and Multi-hop UE-to-Network Relays can be distinguished based on RSC.

\* \* \* \* Next change \* \* \* \*

##### 6.3.2.X.3 Procedure for Multi-hop 5G ProSe UE-to-Network Relay Discovery with Model B

intermediate Relay1

intermediate Relay3

intermediate Relay2

Remote UE1

**……**

U2N Relay

11. choose relay

PCF

0. ProSe Policy

1.decides max hop num

2a. U2N Relay Discovery Solicitation message

4a. U2N Relay Discovery Solicitation message

3a. decides to send Solicitation or Response

3b. decides to send Solicitation or Response

4b. Solicitation message

8a. Response

9a. Response

7. choose Relay

6b. Solicitation message

2b. U2N Relay Discovery Solicitation message

9b. Response

10b. Response

8b. Response

Figure 6.3.2.X.3-1: General Procedures for 5G ProSe Multi-hop UE-to-Network Relay Discovery with Model B

1. The 5G ProSe Remote UE determines the Hop-Limit for discovery based on policy configuration (i.e. a mapping between maximum number of hops and RSC) or QoS requirements.

If the Hop-Limit is determined based on configuration associated with the RSC, the 5G ProSe Remote UE need not include the Hop-Limit in the Solicitation message. Otherwise, the 5G ProSe Remote UE includes the Hop-Limit in the Solicitation message.

2a. The 5G ProSe Remote UE sends a 5G ProSe UE-to-Network Relay Discovery Solicitation message. The 5G ProSe UE-to-Network Relay Discovery Solicitation message additionally contains following IEs compared with that in clause 6.3.2.3.3: an indication that multi-hop relay is supported, hop count and the Hop-Limit.

 The Target Info may contain the User Info ID of UE-to-Network Relay and Intermediate Relay(s).

3a. If an indication that multi-hop relay is supported is contained in the received Solicitation message, the RSC contained in the Solicitation message matches any of the (pre)configured RSC(s), as specified in clause 5.1.4.1a, of a 5G ProSe Intermediate Relay, and the Target Info matches the User Info ID of the 5G ProSe Intermediate Relay (if any), the 5G ProSe Intermediate Relay may decide to send a 5G ProSe UE-to-Network Relay Discovery Solicitation message.

The 5G ProSe Intermediate Relay shall drop the received Solicitation message if the hop count (corresponding to the number of Relays included in the message) has reached the Hop-Limit of the received Solicitation message, or the (pre)configured maximum number of hops associated with the RSC.

 The 5G ProSe Intermediate Relay may send a Response message when it has already found or established PC5 link with 5G ProSe UE-to-Network Relay(s), without sending Solicitation message. i.e., steps 4a-8a are skipped and step 9a is performed directly. The response message additionally contains the User Info ID of UE-to-Network Relay, path information to the UE-to-Network Relay which is an (ordered) list of User Info ID of intermediate Relay(s).

If the same information on User Info IDs of Remote UE and UE-to-Network Relay is received from different ProSe UEs, the 5G ProSe Intermediate UE-to- Network Relay may select a Solicitation message to be sent to the next hop based on various criteria (e.g., hop count, delay, channel quality of received messages, etc.).

NOTE 1: If the 5G ProSe Remote UE does not receive any response after a pre-configured time, based on application requirement, it may increase the Hop-Limit and send the discovery message again.

4a. A 5G ProSe Intermediate Relay sends a Solicitation message, it additionally includes its own User Info ID in the message. i.e., the message contains the path information which is an (ordered) list of User Info ID of Relays in the path that has relayed the Solicitation message. The hop count is increased by 1.

2b.-6b. The Solicitation message from the same Remote UE goes through a different ordered list of 5G ProSe Intermediate Relays.

7-8. If the RSC contained in the solicitation message matches any of the (pre)configured RSC(s), as specified in clause 5.1.4.1, of the 5G ProSe UE-to-Network Relay, and the Target Info matches the User Info ID of the 5G ProSe UE-to-Network Relay (if any), then the 5G ProSe UE-to-Network Relay responds to the 5G ProSe Intermediate Relay with a 5G ProSe UE-to-Network Relay Discovery Response message. The 5G ProSe UE-to- Network Relay Discovery Response message additionally contains the path information compared with that in clause 6.3.2.3.3.

 The 5G ProSe UE-to-Network Relay may choose the path based on e.g., the PC5 signal strength of each message received, hops to the Remote UE, the path information, etc.

Editor's Note: It is FFS how the 5G ProSe UE-to-Network Relay decides when to send the Relay Discovery Response message.

9-10. A 5G ProSe Intermediate Relay forwards the a 5G ProSe UE-to-Network Relay Discovery Response message. The Response message additionally contains the path information.

Editor's Note: It is FFS if and how the Relay Discovery Response message is forwarded along the path indicated in the path information.

11. The Remote UE may perform relay path selection based on e.g., the PC5 signal strength and the number of hops to the 5G ProSe UE-to-Network Relay.

\* \* \* \* Next changes \* \* \* \*

#### 6.4.3.X Layer-2 link management over PC5 reference point for Multi-hop 5G ProSe UE-to-Network Relay (based on Model B Discovery)

The Layer-2 link procedures over PC5 reference point for unicast mode 5G ProSe Direct Communication as depicted from clause 6.4.3.6 is used for the PC5 reference point among 5G ProSe Remote UE, 5G ProSe Intermediate UE-to-Network Relay and UE-to-Network Relay after Model B Discovery, with the following differences and clarifications:

For the UE oriented Layer-2 link establishment as described in the clause 6.4.3.1,

- The 5G ProSe Remote UE determines the destination Layer-2 ID for PC5 unicast link establishment based on the unicast source Layer-2 ID of the selected 5G ProSe Intermediate Relay (as specified in clause 5.8.3) during UE-to-Network Relay discovery as specified in clause 6.3.2.X.

- The 5G ProSe Intermediate Relay determines the destination Layer-2 ID for PC5 unicast link establishment based on the unicast source Layer-2 ID of the selected 5G ProSe Intermediate Relay or UE-to-Network Relay (as specified in clause 5.8.3) during UE-to-Network Relay discovery as specified in clause 6.3.2.X.

Editor's Note: It is FFS how long the 5G ProSe Intermediate Relay keeps the Layer-2 ID information of other realys obtained in the discovery procedures

- 5G ProSe Remote UE sends a unicast Direct Communication Request message to the selected 5G ProSe Intermediate Relay. The Direct Communication Request message additionally includes:

- Path information: an (ordered) list of User Info ID of 5G ProSe Intermediate Relays and the UE-to-Network Relay selected by the 5G ProSe Remote UE based on the path information provided to the 5G ProSe Remote UE during 5G ProSe UE-to-Network Relay Discovery procedure.

 - QoS Info: indicates the End to End QoS Info.

- 5G ProSe Intermediate Relay sends a unicast Direct Communication Request message to the next 5G ProSe Intermediate Relay or the UE-to-Network Relay according to the path information in the received Direct Communication Request message. The Direct Communication Request message additionally includes:

- Path information: an (ordered) list of User Info ID of 5G ProSe Intermediate Relays and the UE-to-Network Relay selected by the 5G ProSe Remote UE based on the path information provided to the 5G ProSe Remote UE during 5G ProSe UE-to-Network Relay Discovery procedure.

- QoS Info: End to End QoS Info and the remaining QoS Info of hops from the Intermediate Relay to the network.

- In step 4 and step 5, step 4a and step 5a are performed if the 5G ProSe Intermediate/UE-to-Network Relay's identity matches the Target Info (if any) and the Relay Service Code is one of the Relay Service Codes included during UE-to-Network Relay discovery as specified in clause 6.3.2.X.

Editor’s note: Details of QoS info content is FFS.

For the Layer-2 link release as described in the clause 6.4.3.3,

- If the Layer-2 link release procedure is initiated by the 5G ProSe Intermediate Relay, the Disconnect Request message may indicate the 5G ProSe UE-to-Network Relay is temporarily not available as described in clause 5.12.

- If the service authorization for acting as a 5G ProSe Intermediate Relay is revoked, the 5G ProSe Intermediate Relay should initiate the release of the layer-2 link that the revoked authorization affects.

Each PC5 unicast link for 5G ProSe UE-to-Network Relay is associated with a Unicast Link Profile, which additionally includes:

- Path Information: which contains the User Info ID of Intermediate Relay at the next hop to the Remote UE.Each PC5 unicast link for 5G ProSe Intermediate Relay is associated with a Unicast Link Profile, which additionally includes:

- Path Information: which contains the User Info ID of Intermediate Relay or UE-to-Network Relay at the adjancent hop.\* \* \* \* Next changes \* \* \* \*

#### 6.5.1.X 5G ProSe Communication via Multi-hop 5G ProSe Layer-3 UE-to-Network Relay without N3IWF (based on Model B Discovery)

Remote UE

Intermediate Relay

U2N Relay

NG-RAN

AMF

SMF

UPF

1. 5GS Registration, authorization and provisioning for U2N Relay and Intermediate Relays

1. 5GS Registration, authorization and provisioning for Remote UE

3. Multi-hop U2N Relay Discovery Procedure

4. Establishment of connection for unicast PC5 communication

4. U2N Relay may establish new PDU session(s) for relaying

5. IP address/prefix allocation

6. Layer-2 link modification

2. PDU Session Establishment

6. U2N Relay may modify existing PDU Session for relaying

7. Remote UE Report (Remote UE ID, Remote UE info)

Relayed traffic

Figure 6.5.1.X-1: Connection establishment via Multi-hop 5G ProSe Layer-3 UE-to-Network Relay without N3IWF support

Connection establishment via Multi-hop 5G ProSe Layer-3 UE-to-Network Relay without N3IWF support as described in clause 6.5.1.1 is used for multi-hop UE-to-Network Relay after Model B Discovery with the following differences and clarifications:

1. Service authorization and provisioning are performed for the 5G ProSe Layer-3 UE-to-Network Relay, Intermediate Relay(s) and 5G ProSe Layer-3 Remote UE.

2. The 5G ProSe Layer-3 UE-to-Network Relay may establish a PDU Session for relaying.

3. The 5G ProSe Layer-3 Remote UE performs Model B discovery of a 5G ProSe Layer-3 UE-to-Network Relay. The Remote UE obtains the path information to the UE-to-Network Relay(s) from the discovery procedure.

4. The 5G ProSe Layer-3 Remote UE selects a path and establishes a connection for unicast mode communication as described in clause 6.4.3.X.

5. For IP PDU Session Type and IP traffic over PC5 reference point, the UE-to-Network Relay assigns IPv6 prefix or IPv4 address to Intermediate Relay(s) and the Remote UE. The Intermediate Relay act as DHCP proxy or relay the IP allocation message (e.g., Router Solicitation, Advertisement).

6. The 5G ProSe Layer-3 Remote UE may provide PC5 QoS Info and PC5 QoS rule(s) to the 5G ProSe Layer-3 UE-to-Network Relay using Layer-2 link modification procedure via Intermediate Relay(s). Intermediate Relays may split the PC5 QoS hop-by-hop as described in clause 5.6.X.

Editor’s note: It is FFS how to handle QoS.

7. For the Remote UE Report, the Remote User ID is an identity of the 5G ProSe Layer-3 Remote UE.

 For IP PDU Session Type, the Remote UE info is IP info related to Remote UE.

- for IPv4, the 5G ProSe Layer-3 UE-to-Network Relay shall report IP address and TCP/UDP port ranges that are assigned to 5G ProSe Layer-3 Remote UE(s) by the UE-to-Network Relay;

- 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).

 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.

NOTE: For IP type of PDU Sessions, the Intermediate Relays forward the Downlink packet to the correct PC5 links based on destination IP address of the packet. For Ethernet type of PDU Sessions, the Intermediate Relay forwards the Downlink packets according to the destination Ethernet MAC address.

#### 6.5.1.Y 5G ProSe Communication via Multi-hop 5G ProSe Layer-3 UE-to-Network Relay with N3IWF after Model B Discovery

5G ProSe Communication via 5G ProSe Layer-3 UE-to-Network Relay with N3IWF as described in clause 6.5.1.2 is used for multi-hop UE-to-Network Relay after Model B Discovery with the following differences and clarifications:

Remote UE

Intermediate Relay

U2N Relay

NG-RAN

AMF

SMF

UPF

N3IWF

1. 5GS Registration and/or PDU Session connectivity (UE PRoSe Policy)

1. 5GS Registration, authorization and provisioning (UE ProSe Policy, URSP)

2. Multi-hop U2N Relay Discovery Procedure

3. Establishment of connection for one-to-one PC5 communication session

3. U2N Relay may establish new PDU session(s) for relay

4. IP address/prefix allocation

5. Remote UE selects an N3IWF and obtains its IP address

6. Remote UE performs NAS Registration and establishes IPSec tunnel using IKE procedures with N3IWF as described in clause 4.12.2.2 of TS 23.502

7. Additional Child SA, configuration and QoS policies are exchanged

Figure 6.5.1.Y-1: 5G ProSe Communication via Multi-hop 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 5G ProSe Layer-3 Remote UE is configured with the corresponding ProSe Policy and URSP rules.

 Supporting of the RSC configured for making the 5G ProSe Layer-3 Remote UE access to 5GC via N3IWF is preconfigured or provisioned to the Intermediate Relay by the ProSe Policy.

2-4. A 5G ProSe Layer-3 UE-to-Network Relay, 5G ProSe Intermediate Relay(s) and 5G ProSe Layer-3 Remote UE perform multi-hop discovery using the RSC configured for making the 5G ProSe Layer-3 Remote UE access to 5GC via N3IWF. The Remote UE obtains the path information to the UE-to-Network Relay(s) from the discovery procedure. Details of discovery procedure and path establishement procedure are described in clause 6.3.2.X.3 and 6.4.3.X, respectively.

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.

6. The 5G ProSe Layer-3 Remote UE establishes a signalling IPsec tunnel using IKE procedures with an N3IWF via Intermediate Relays and UE-to-Network Relay performs NAS Registration as described in clause 4.12.2.2 of TS 23.502[5].

7. 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 5.6.2.2, taking the number of hops into account.

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