**3GPP TSG-CT WG1 Meeting #134-eC1-22xxxx**

**E-Meeting, 17th – 25th February 2022**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Resolving the Editor's notes related to security topics for different 5G ProSe direct link procedures**

**Spec: 3GPP TS** **TS 24.554 V1.1.0**

**Agenda item: 17.2.18**

**Document for: Agreement**

**1. Reason for Change**

Multiple Editor's notes exist in TS 24.554 because both the 5G ProSe direct link security mode control procedure and the 5G ProSe direct link authentication procedure were not defined yet.

Given that those procedures have now been defined in stage-3, where the security procedures for V2X 5G were adopted for that purpose, as stage-2 SA3 security group states in TS 33.503 the following:

*6.2.3 Security procedures*

*The unicast mode security mechanism defined in clause 5.3 of TS 33.536 [6] is reused in 5G ProSe to provide unicast mode 5G ProSe Direct communication security.*

Hence the corresponding Editor's notes can be safely removed from the procedures clauses in stage-3 spec with no extra change, which is done using this pCR.

Also, only one new Editor's note is added in clause "7.2.2.1 General" and in clause "7.2.6.1 General" to indicate that possible changes to the 5G ProSe direct link establishment procedure and 5G ProSe direct link release procedure due to supporting 5G ProSe layer-3 UE-to-network relay are FFS (such as including MSBs of KNRP ID in the PROSE DIRECT LINK RELEASE REQUEST message…etc).

**2. Proposal**

It is proposed to agree the following changes to 3GPP TS 24.554 V1.1.0.

\* \* \* First Change \* \* \* \*

#### 7.2.2.1 General

Depending on the type of the 5G ProSe direct link establishment procedure (i.e., UE oriented layer-2 link establishment or ProSe service oriented layer-2 link establishment in 3GPP TS 23.304 [2]), the 5G ProSe direct link establishment procedure is used to establish a 5G ProSe direct link between two UEs or to establish multiple 5G ProSe direct links. The UE sending the request message is called the "initiating UE" and the other UE is called the "target UE". If the request message does not indicate the specific target UE (i.e., target user info is not included in the request message), and multiple target UEs are interested in the ProSe application(s) indicated in the request message, then the initiating UE shall handle corresponding response messages received from those target UEs. The maximum number of 5G ProSe direct links established in a UE at a time shall not exceed an implementation-specific maximum number of established 5G ProSe direct links.

NOTE: The recommended maximum number of established PC5 unicast link is 8.

When the 5G ProSe direct link establishment procedure for a 5G ProSe layer-3 remote UE completes successfully, and if there is a PDU session established for relaying the traffic of the remote UE, the 5G ProSe layer-3 UE-to-network relay UE shall perform the remote UE report procedure as specified in 3GPP TS 24.501 [11].

After the 5G ProSe direct link establishment procedure for a 5G ProSe layer-2 remote UE completes successfully, and upon getting a request from the 5G ProSe layer-2 remote UE through lower layers, the 5G ProSe layer-2 UE-to-network relay UE, if in 5GMM-IDLE mode, shall inform lower layers to perform a service request procedure as specified in 3GPP TS 24.501 [11].

Editor's note: Any possible changes to the 5G ProSe direct link establishment procedure due to the security requirements of 5G ProSe layer-2 UE-to-network relay or 5G ProSe layer-3 UE-to-network relay (such as adding new IEs or changing existing IEs) are FFS.

\* \* \* Next Change \* \* \* \*

#### 7.2.2.3 5G ProSe direct link establishment procedure accepted by the target UE

Upon receipt of a PROSE DIRECT LINK ESTABLISHMENT REQUEST message, if the target UE accepts this request, the target UE shall uniquely assign a PC5 link identifier, create a 5G ProSe direct link context.

If the PROSE DIRECT LINK ESTABLISHMENT REQUEST message is not used for 5G ProSe direct communication between the remote UE and the UE-to-network relay UE, the target UE assigns a layer-2 ID for this PC5 unicast link. The newly assigned layer-2 ID replaces the target layer-2 ID as received on the PROSE DIRECT LINK ESTABLISHMENT REQUEST message. Then the target UE shall store this assigned layer-2 ID and the source layer-2 ID used in the transport of this message provided by the lower layers in the 5G ProSe direct link context.

The target UE may initiate 5G ProSe direct link authentication procedure as specified in clause XYZZ and shall initiate 5G ProSe direct link security mode control procedure as specified in clause 7.2.10.

NOTE: It is possible for the target UE to reuse the target UE’s layer-2 ID used in the transport of the PROSE DIRECT LINK ESTABLISHMENT REQUEST message provided by the lower layers in case that the target UE’s layer-2 ID has been used in previous 5G ProSe direct link with the same peer.

If:

a) the target user info IE is included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message and this IE includes the target UE’s application layer ID; or

b) the target user info IE is not included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message and the target UE is interested in the ProSe application(s) identified by the ProSe identifier IE in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message;

then the target UE shall either:

a) identify an existing KNRP based on the KNRP ID included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message; or

b) if KNRP ID is not included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message, the target UE does not have an existing KNRP for the KNRP ID included in PROSE DIRECT LINK ESTABLISHMENT REQUEST message or the target UE wishes to derive a new KNRP, derive a new KNRP. This may require performing one or more 5G ProSe direct link authentication procedures as specified in clause XYZZ.

NOTE: How many times the 5G ProSe direct link authentication procedure needs to be performed to derive a new KNRP depends on the authentication method used.

After an existing KNRP was identified or a new KNRP was derived, the target UE shall initiate a 5G ProSe direct link security mode control procedure as specified in clause 7.2.10.

Upon successful completion of the 5G ProSe direct link security mode control procedure, in order to determine whether the PROSE DIRECT LINK ESTABLISHMENT REQUEST message can be accepted or not, in case of IP communication, the target UE checks whether there is at least one common IP address configuration option supported by both the initiating UE and the target UE.

Before sending the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message to the remote UE, the target UE acting as a 5G ProSe layer-3 UE-to-network relay UE shall inform the lower layer to initiate the UE requested PDU session establishment procedure as specified in 3GPP TS 24.501 [11] if:

1) the PDU session for relaying the service associated with the RSC has not been established yet; or

2) the PDU session for relaying the service associated with the RSC has been established but the PDU session type is Unstructured.

If the target UE accepts the 5G ProSe direct link establishment procedure, the target UE shall create a PROSE DIRECT LINK ESTABLISHMENT ACCEPT message. The target UE:

a) shall include the source user info set to the target UE’s application layer ID received from upper layers;

b) shall include PQFI(s), the corresponding PC5 QoS parameters and optionally the ProSe identifier(s) that the target UE accepts, if the target UE is not acting as a 5G ProSe layer-2 UE-to-network relay UE;

c) may include the PC5 QoS rule(s) if the target UE is not acting as a 5G ProSe layer-2 UE-to-network relay UE;

d) shall include an IP address configuration IE set to one of the following values if IP communication is used and the target UE is not acting as a 5G ProSe layer-2 UE-to-network relay UE:

1) "DHCPv4 server" if only IPv4 address allocation mechanism is supported by the target UE, i.e., acting as a DHCPv4 server; or

2) "IPv6 router" if only IPv6 address allocation mechanism is supported by the target UE, i.e., acting as an IPv6 router; or

3) "DHCPv4 server & IPv6 Router" if both IPv4 and IPv6 address allocation mechanism are supported by the target UE; or

4) "address allocation not supported" if neither IPv4 nor IPv6 address allocation mechanism is supported by the target UE and the target UE is not acting as a 5G ProSe layer-3 UE-to-network relay UE;

NOTE: The UE doesn't include an IP address configuration IE nor a link local IPv6 address IE, if Ethernet or Unstructured data unit type is used for communication.

e) shall include a link local IPv6 address IE formed locally based on IETF RFC 4862 [16] if IP address configuration IE is set to "address allocation not supported", the received PROSE DIRECT LINK SECURITY MODE COMPLETE message included a link local IPv6 address IE and the target UE is neither acting as a 5G ProSe layer-2 UE-to-network relay UE nor acting as a 5G ProSe layer-3 relay UE; and

f) shall include the configuration of UE PC5 unicast user plane security protection based on the agreed user plane security policy, as specified in 3GPP TS 33.503 [34].

After the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message is generated, the target UE shall pass this message to the lower layers for transmission along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication, and shall start timer Taaaa if at least one of ProSe identifiers for the 5G ProSe direct links satisfies the privacy requirements as specified in clause 5.2.

After sending the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, the target UE shall provide the following information along with the layer-2 IDs to the lower layer, which enables the lower layer to handle the coming PC5 signalling or traffic data:

a) the PC5 link identifier self-assigned for this PC5 unicast link;

b) PQFI(s) and its corresponding PC5 QoS parameters, if available; and

c) an indication of activation of the PC5 unicast user plane security protection for the PC5 unicast link, if applicable.

If the target UE accepts the 5G ProSe direct link establishment request and the 5G ProSe direct link is established not for 5G ProSe direct communication between the remote UE and the UE-to-network relay UE, then the target UE may perform the PC5 QoS flow establishment over 5G ProSe direct link as specified in clause 7.2.7. If the 5G ProSe direct link is established for 5G ProSe direct communication between the remote UE and the layer-3 UE-to-network relay UE, then the target UE may perform the PC5 QoS flow establishment over 5G ProSe direct link as specified in clause 8.2.6.

\* \* \* Next Change \* \* \* \*

#### 7.2.2.4 5G ProSe direct link establishment procedure completion by the initiating UE

If the Target user info IE is included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message, upon receipt of the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE shall stop timer T5080. If the Target user info IE is not included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message the initiating UE may keep the timer T5080 running and continue to handle multiple response messages (i.e., the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message) from multiple target UEs.

For each of the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message received, the initiating UE shall uniquely assign a PC5 link identifier and create a 5G ProSe direct link context for each of the PC5 unicast link(s). Then the initiating UE shall store the source layer-2 ID and the destination layer-2 ID used in the transport of this message provided by the lower layers in the 5G ProSe direct link context(s) to complete the establishment of the 5G ProSe direct link with the target UE(s). From this time onward the initiating UE shall use the established link(s) for ProSe direct communication over PC5 and additional PC5 signalling messages to the target UE(s).

After receiving the PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE shall provide the following information along with the layer-2 IDs to the lower layer, which enables the lower layer to handle the coming PC5 signalling or traffic data:

a) the PC5 link identifier self-assigned for this PC5 unicast link;

b) PQFI(s) and its corresponding PC5 QoS parameters, if available; and

c) an indication of activation of the PC5 unicast user plane security protection for the PC5 unicast link, if applicable.

The initiating UE shall start timer Taaaa if at least one of ProSe identifiers for the 5G ProSe direct links satisfies the privacy requirements as specified in clause 5.2.

In addition, the initiating UE may perform the PC5 QoS flow establishment over 5G ProSe direct link as specified in clause 7.2.7.

Upon expiry of the timer T5080, if the PROSE DIRECT LINK ESTABLISHMENT REQUEST message did not include the Target user info IE, and the initiating UE received at least one PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, it is up to the UE implementation to consider the 5G ProSe direct link establishment procedure as complete or to restart the timer T5080.

\* \* \* Next Change \* \* \* \*

#### 7.2.2.5 5G ProSe direct link establishment procedure not accepted by the target UE

If the PROSE DIRECT LINK ESTABLISHMENT REQUEST message cannot be accepted, the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message. The PROSE DIRECT LINK ESTABLISHMENT REJECT message contains a PC5 signalling protocol cause IE set to one of the following cause values:

#1 direct communication to the target UE not allowed;

#3 conflict of layer-2 ID for unicast communication is detected;

#5 lack of resources for PC5 unicast link;

#13 congestion situation; or

#111 protocol error, unspecified.

If the target UE is not allowed to accept the PROSE DIRECT LINK ESTABLISHMENT REQUEST message, e.g., based on operator policy or configuration parameters for ProSe direct communication over PC5 as specified in clause 5.2, or the target UE is acting as a layer-3 relay UE, is in non-allowed area of its serving PLMN, and the corresponding relay service code is not associated with an emergency services or high priority access as defined in clause 5.3.5 of 3GPP TS 24.501 [11], the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #1 "direct communication to the target UE not allowed".

For a received PROSE DIRECT LINK ESTABLISHMENT REQUEST message from a layer-2 ID (for unicast communication), if the target UE already has an existing link established to a UE using this layer-2 ID or is currently processing a PROSE DIRECT LINK ESTABLISHMENT REQUEST message from the same layer-2 ID, and with one of following parameters different from the existing link or the link for which the link establishment is in progress:

a) the source user info;

b) type of data (e.g., IP or non-IP); or

c) security policy,

the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #3 "conflict of layer-2 ID for unicast communication is detected".

NOTE 1: The type of data (e.g., IP or non-IP) is indicated by the optional IP address configuration IE included in the corresponding DIRECT LINK SECURITY MODE COMPLETE message, i.e., the type of data for the requested link is IP type if this IE is included, and the type of data for the requested link is non-IP if this IE is not included.

If the 5G ProSe direct link establishment fails due to the implementation-specific maximum number of established 5G ProSe direct links has been reached, or other temporary lower layer problems causing resource constraints, the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #5 "lack of resources for PC5 unicast link".

If the 5G ProSe direct link establishment request is for relaying and:

a) the NAS level mobility management congestion control as specified in clause 5.3.9 of TS 24.501 [11] is activated at the target UE; or

b) the target UE is under congestion;

the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #13 "congestion situation". The target UE may provide a back-off timer value to the initiating UE in the PROSE DIRECT LINK ESTABLISHMENT REJECT message. The target UE shall not accept any 5G ProSe direct link establishment request for relaying if the back-off timer for NAS level mobility management congestion control is running.

NOTE 2: How the target UE determines that it is under congestion is implementation specific (e.g., any relaying related operational overhead, etc).

NOTE 3: In case the target UE is under the NAS level mobility management congestion control, it is an implementation option that the provided back-off timer value to the initiating UE is set to the remaining time of the mobility management back-off timer T3346 or with an additional offset value.

If the 5G ProSe direct link establishment fails due to other reasons, the target UE shall send a PROSE DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #111 "protocol error, unspecified".

After sending the PROSE DIRECT LINK ESTABLISHMENT REJECT message, the target UE shall provide the following information along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication to the lower layer:

a) an indication of deactivation of the PC5 unicast security protection and deletion of security context for the PC5 unicast link, if applicable.

Upon receipt of the PROSE DIRECT LINK ESTABLISHMENT REJECT message, the initiating UE shall stop timer T5080 and abort the 5G ProSe direct link establishment procedure. If the PC5 signalling protocol cause value in the PROSE DIRECT LINK ESTABLISHMENT REJECT message is #1 "direct communication to the target UE not allowed" or #5 "lack of resources for PC5 unicast link", then the initiating UE shall not attempt to start the 5G ProSe direct link establishment procedure with the same target UE at least for a time period T. If the PC5 signalling protocol cause value in the PROSE DIRECT LINK ESTABLISHMENT REJECT message is #13 "congestion situation" and a back-off timer value is provided in the PROSE DIRECT LINK ESTABLISHMENT REJECT message, the initiating UE shall start timer T5088 associated with the layer-2 ID of the target UE and set its value to the provided timer value.

NOTE 4: The length of time period T is UE implementation specific and can be different for the case when the UE receives PC5 signalling protocol cause value #1 "direct communication to the target UE not allowed" or when the UE receives PC5 signalling protocol cause value #5 "lack of resources for 5G ProSe direct link".

After receiving the PROSE DIRECT LINK ESTABLISHMENT REJECT message, the initiating UE shall provide the following information along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication to the lower layer:

a) an indication of deactivation of the PC5 unicast security protection and deletion of security context for the 5G ProSe direct link, if applicable.

\* \* \* Next Change \* \* \* \*

##### 7.2.2.6.1 Abnormal cases at the initiating UE

If timer T5080 expires and the Target user info IE is included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message, the initiating UE shall retransmit the PROSE DIRECT LINK ESTABLISHMENT REQUEST message and restart timer T5080. After reaching the maximum number of allowed retransmissions, the initiating UE shall abort the 5G ProSe direct link establishment procedure and may notify the upper layer that the target UE is unreachable.

Upon expiry of the timer T5080, if the PROSE DIRECT LINK ESTABLISHMENT REQUEST message did not include the Target user info IE and the initiating UE did not receive any PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, the initiating UE may retransmit the PROSE DIRECT LINK ESTABLISHMENT REQUEST message and restart timer T5080. If the PROSE DIRECT LINK ESTABLISHMENT REQUEST message did not include the Target user info IE and the initiating UE did not receive any PROSE DIRECT LINK ESTABLISHMENT ACCEPT message, then after reaching the maximum number of allowed retransmissions, the initiating UE shall abort the 5G ProSe direct link establishment procedure and may notify the upper layer that no target UE is available.

NOTE: The maximum number of allowed retransmissions is UE implementation specific.

If the need to establish a link no longer exists before the procedure is completed, the initiating UE shall abort the procedure.

When the initiating UE aborts the 5G ProSe direct link establishment procedure, the initiating UE shall provide the following information along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication to the lower layer:

a) an indication of deactivation of the PC5 unicast security protection and deletion of security context for the PC5 unicast link, if applicable.

\* \* \* Next Change \* \* \* \*

#### 7.2.3.2 5G ProSe direct link modification procedure initiated by initiating UE

The initiating UE shall meet the following pre-conditions before initiating this procedure for adding a new ProSe application to the existing 5G ProSe direct link:

a) there is a 5G ProSe direct link between the initiating UE and the target UE;

b) the pair of application layer IDs and the network layer protocol of this 5G ProSe direct link are identical to those required by the application layer in the initiating UE for this ProSe application; and

c) the security policy corresponding to the ProSe identifier is aligned with the security policy of the existing 5G ProSe direct link.

After receiving the service data or request from the upper layers, the initiating UE shall perform the PC5 QoS flow match as specified in clause 7.2.8. If there is no matched PC5 QoS flow, the initiating UE shall derive the PC5 QoS parameters and assign the PQFI(s) for the PC5 QoS flows(s) to be established as specified in clause 7.2.7.

If the 5G ProSe direct link modification procedure is to add new PC5 QoS flow(s) to the existing 5G ProSe direct link, the initiating UE shall create a PROSE DIRECT LINK MODIFICATION REQUEST message. In this message, initiating UE:

a) shall include the PQFI(s), the corresponding PC5 QoS parameters and optionally the ProSe identifier(s);

b) shall include the link modification operation code set to "Add new PC5 QoS flow(s) to the existing 5G ProSe direct link "; and

c) may include the PC5 QoS rule(s) to indicate the packet filters of the PC5 QoS flow(s).

If the 5G ProSe direct link modification procedure is to modify the PC5 QoS parameters for existing PC5 QoS flow(s) in the existing 5G ProSe direct link, the initiating UE shall create a PROSE DIRECT LINK MODIFICATION REQUEST message. In this message, the initiating UE:

a) shall include the PQFI(s) and the corresponding PC5 QoS parameters, including the ProSe identifier(s);

b) shall include the link modification operation code set to "Modify PC5 QoS parameters of the existing PC5 QoS flow(s)"; and

c) may include the PC5 QoS rule(s) to indicate the packet filters of the PC5 QoS flow(s).

If the 5G ProSe direct link modification procedure is to associate new ProSe application(s) with existing PC5 QoS flow(s), the initiating UE shall create a PROSE DIRECT LINK MODIFICATION REQUEST message. In this message, the initiating UE:

a) shall include the PQFI(s) and the corresponding PC5 QoS parameters, including the ProSe identifier(s);

b) shall include the link modification operation code set to "Associate new ProSe application(s) with existing PC5 QoS flow(s)"; and

c) may include the PC5 QoS rule(s) to indicate the packet filters of the PC5 QoS flow(s).

If the PC5 5G ProSe direct link modification procedure is to remove the associated ProSe application(s) from existing PC5 QoS flow(s), the initiating UE shall create a PROSE DIRECT LINK MODIFICATION REQUEST message. In this message, the initiating UE:

a) shall include the PQFI(s) and the corresponding PC5 QoS parameters including the ProSe identifier(s); and

b) shall include the link modification operation code set to "Remove ProSe application(s) from existing PC5 QoS flow(s)".

If the direct link modification procedure is to remove any PC5 QoS flow(s) from the existing 5G ProSe direct link, the initiating UE shall create a PROSE DIRECT LINK MODIFICATION REQUEST message. In this message, the initiating UE:

a) shall include the PQFI(s); and

b) shall include the link modification operation code set to "Remove existing PC5 QoS flow(s) from the existing 5G ProSe direct link".

After the PROSE DIRECT LINK MODIFICATION REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's layer-2 ID for 5G ProSe direct communication and the target UE's layer-2 ID for 5G ProSe direct communication, and start timer T5081. The UE shall not send a new PROSE DIRECT LINK MODIFICATION REQUEST message to the same target UE while timer T5081 is running.



Figure 7.2.3.2.1: 5G ProSe direct link modification procedure

\* \* \* Next Change \* \* \* \*

#### 7.2.6.1 General

The 5G ProSe direct link release procedure is used to release a secure 5G ProSe direct link between two UEs. The link can be released from either end point. The UE sending the PROSE DIRECT LINK RELEASE REQUEST message is called the "initiating UE" and the other UE is called the "target UE".

If the UE receives an indication of radio link failure or an indication of PC5-RRC connection release from the lower layer, the UE shall release the 5G ProSe direct link locally and may delete the KNRP ID associated with this link after an implementation specific time.

When the direct link between a remote UE and a 5G ProSe UE-to-network relay UE is released, the 5G ProSe layer-3 UE-to-network relay UE shall perform the remote UE report procedure as specified in 3GPP TS 24.501 [11].

Editor's note: Any possible changes to the 5G ProSe direct link release procedure due to the security requirements of 5G ProSe layer-2 UE-to-network relay or 5G ProSe layer-3 UE-to-network relay (such as adding new IEs or changing existing IEs) are FFS.

\* \* \* Next Change \* \* \* \*

#### 7.2.6.2 5G ProSe direct link release procedure initiation by initiating UE

The initiating UE shall initiate the procedure if a request from upper layers to release a 5G ProSe direct link with the target UE which uses a known layer-2 ID (for unicast communication) is received and there is an existing 5G ProSe direct link between these two UEs.

The initiating UE may initiate the procedure if the target UE has been non-responsive, e.g., no response in the PC5 unicast direct link modification procedure, PC5 unicast direct link identifier update procedure, PC5 unicast direct link re-keying procedure or PC5 unicast direct link keep-alive procedure.

The initiating UE may initiate the procedure to release an established 5G ProSe direct link if the UE has reached the maximum number of established 5G ProSe direct links and there is a need to establish a new 5G ProSe direct link. In this case, which 5G ProSe direct link is to be released is up to UE implementation.

The initiating UE may initiate the procedure to release an established 5G ProSe direct link upon expiry of the timer T5084.

If:

a) the initiating UE acts as 5G ProSe layer-3 UE-to-network relay UE; and

b) the PDU session established for relaying the traffic of the target UE is released by the initiating UE or the network as specified in 3GPP TS 24.501 [11] clause 6.3.3 or clause 6.4.3;

the initiating UE should initiate the 5G ProSe direct link release procedure.

If:

a) the initiating UE acts as 5G ProSe layer-2 remote UE or 5G ProSe layer-3 remote UE for relay with N3IWF support; and

b) the initiating UE is in 5GMM-IDLE mode;

the initiating UE may initiate the 5G ProSe direct link release procedure.

If:

a) the initiating UE acts as 5G ProSe layer-2 remote UE, 5G ProSe layer-3 remote UE or 5G ProSe layer-2 UE-to-network relay UE; and

b) the service authorization for the initiating UE to act as 5G ProSe layer-2 remote UE, 5G ProSe layer-3 remote UE or 5G ProSe layer-2 UE-to-network relay UE is revoked after receiving the configuration parameters for 5G ProSe UE-to-network relay as specified in clause 5.2.5;

the initiating UE should initiate the 5G ProSe direct link release procedure.

If:

a) the initiating UE acts as 5G ProSe layer-3 UE-to-network relay UE; and

b) the service authorization for the initiating UE to act as 5G ProSe layer-3 UE-to-network relay UE in the serving PLMN is revoked after receiving the configuration parameters for 5G ProSe UE-to-network relay as specified in clause 5.2.5;

the initiating UE should initiate the 5G ProSe direct link release procedure and shall inform lower layers to release the PDU session established for relaying the traffic of the target UE as specified in 3GPP TS 24.501 [11] clause 6.4.3.

In order to initiate the 5G ProSe direct link release procedure, the initiating UE shall create a PROSE DIRECT LINK RELEASE REQUEST message with a PC5 signalling protocol cause IE indicating one of the following cause values:

#1 direct communication to the target UE not allowed;

#2 direct communication to the target UE no longer needed;

#4 direct connection is not available anymore;

#5 lack of resources for PC5 unicast link;

#13 congestion situation; or

#111 protocol error, unspecified.

If the 5G ProSe direct link was established for relaying and:

a) the NAS level mobility management congestion control as specified in clause 5.3.9 of TS 24.501 [11] is activated at the initiating UE; or

b) the initiating UE is under congestion;

the initiating UE shall send a PROSE DIRECT LINK RELEASE REQUEST message containing PC5 signalling protocol cause value #13 "congestion situation". The initiating UE may provide a back-off timer value to the target UE in the PROSE DIRECT LINK RELEASE REQUEST message. The initiating UE shall not accept any 5G ProSe direct link establishment request for relaying if the back-off timer NAS level mobility management congestion control is running.

NOTE 1: How the initiating UE determines that it is under congestion is implementation specific (e.g., any relaying related operational overhead, etc).

NOTE 2: In case the initiating UE is under the NAS level mobility management congestion control, it is an implementation option that the provided back-off timer value to the target UE is set to the mobility management back-off timer T3346 or with an additional offset value.

The initiating UE shall include the new MSBs of KNRP ID in the PROSE DIRECT LINK RELEASE REQUEST message.

After the PROSE DIRECT LINK RELEASE REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's layer-2 ID for unicast communication and the target UE's layer-2 ID for unicast communication, and shall stop T5091 if running. The initiating UE shall start timer T5087.



Figure 7.2.6.2.1: 5G ProSe direct link release procedure

\* \* \* End of Changes \* \* \* \*