**3GPP TSG-CT WG1 Meeting #137-eC1-22xxxx**

**E-Meeting, 18th – 26th August 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **24.554** | **CR** | **0145** | **rev** | **1** | **Current version:** | **17.1.0** |  |
|  |
| *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 |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Introducing the 5GPRUK ID in the DCR procedure |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5G\_ProSe |  | ***Date:*** | 2022-07-04 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | As specified in TS 33.503, clause 6.3.3.3.2 for the control plane security solution for the UE-to-network relay:*If the 5G ProSe Remote UE does not have a valid 5G Prose Remote User Key (5GPRUK), the 5G ProSe Remote UE shall include SUCI in the DCR to trigger 5G ProSe Remote UE specific authentication and establish a 5GPRUK.* *If the 5G ProSe Remote UE already has a valid 5GPRUK, the 5G ProSe Remote UE shall include the 5GPRUK ID in the DCR to indicate that the 5G ProSe Remote UE wants to get relay connectivity using the 5GPRUK.* Hence the DCR procedure needs to be extended to support the inclusion of the 5GPRUK ID. |
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| ***Summary of change:*** | Introducing the 5GPRUK ID in the DCR procedure and including this value in the DCR message and IE.It is proposed here to modify the existing IE (PRUK ID IE) in order to support the inclusion of the 5G PRUK ID as well, instead of introducing a new IE. This is done given the fact that both PURK ID and 5GPRUK ID can't be included at the same time in the DCR message (both are mutually exclusive). |
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| ***Consequences if not approved:*** | No possibility to include the 5GPRUK ID in the DCR procedure and hence the control plane security solution becomes incomplete. |
|  |  |
| ***Clauses affected:*** | 7.2.2.2, 10.3.1.1, 10.3.1.10, 11.3.32 |
|  |  |
|  | **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 \*\*\*\*\*

#### 7.2.2.2 5G ProSe direct link establishment procedure initiation by initiating UE

The initiating UE shall meet the following pre-conditions before initiating this procedure:

a) a request from upper layers to transmit the packet for ProSe application over PC5;

b) the communication mode is unicast mode (e.g., pre-configured as specified in clause 5.2.4 or indicated by upper layers);

c) the link layer identifier for the initiating UE (i.e., layer-2 ID used for unicast communication) is available (e.g., pre-configured or self-assigned) and is not being used by other existing 5G ProSe direct links within the initiating UE;

d) the link layer identifier for the destination UE (i.e., the unicast layer-2 ID of the target UE or the broadcast layer-2 ID) is available to the initiating UE (e.g., pre-configured, obtained as specified in clause 5.2 or known via prior ProSe direct communication);

NOTE 1: In the case where different ProSe applications are mapped to distinct default destination layer-2 IDs, when the initiating UE intends to establish a single unicast link that can be used for more than one ProSe identifiers, the UE can select any of the default destination layer-2 ID for unicast initial signalling.

e) the initiating UE is either authorised for 5G ProSe direct communication over PC5 in NR-PC5 in the serving PLMN, has a valid authorization for 5G ProSe direct communication over PC5 in NR-PC5 when not served by NG-RAN, or is authorized to use a 5G ProSe UE-to-network relay UE. The UE considers that it is not served by NG-RAN if the following conditions are met:

1) not served by NG-RAN for ProSe direct communication over PC5;

2) in limited service state as specified in 3GPP TS 23.122 [14], if the reason for the UE being in limited service state is one of the following;

i) the UE is unable to find a suitable cell in the selected PLMN as specified in 3GPP TS 38.304 [15];

ii) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #11 "PLMN not allowed" as specified in 3GPP TS 24.501 [11]; or

iii) the UE received a REGISTRATION REJECT message or a SERVICE REJECT message with the 5GMM cause #7 "5GS services not allowed" as specified in 3GPP TS 24.501 [11]; or

3) in limited service state as specified in 3GPP TS 23.122 [14] for reasons other than i), ii) or iii) above and located in a geographical area for which the UE is provisioned with "non-operator managed" radio parameters as specified in clause 5.2;

f) there is no existing 5G ProSe direct link for the pair of peer application layer IDs, or there is an existing 5G ProSe direct link for the pair of peer application layer IDs and:

1) the network layer protocol of the existing 5G ProSe direct link is not identical to the network layer protocol required by the upper layer in the initiating UE for this ProSe application;

2) the security policy (either signalling security policy or user plane security policy) corresponding to the ProSe identifier is not compatible with the security policy of the existing 5G ProSe direct link; or

3) in case of the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE, the existing 5G ProSe direct link for the peer UE is established with a different RSC or without an RSC;

g) the number of established 5G ProSe direct links is less than the implementation-specific maximum number of established 5G ProSe direct links allowed in the UE at a time; and

h) timer T5088 is not associated with the link layer identifier for the destination UE or timer T5088 associated with the link layer identifier for the destination UE has already expired or stopped.

After receiving the service data or request from the upper layers, 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 establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE, then the UE shall apply the DUIK, DUSK, or DUCK with the associated encrypted bitmask used for UE-to-network relay discovery along with the UTC-based counter for security protection of the relay service code and the 5G PRUK ID, if available, (see clause 6.3.5.2 of 3GPP TS 33.503 [34]) and the UE shall use the security protected relay service code or the security protected 5G PRUK ID for creating a PROSE DIRECT LINK ESTABLISHMENT REQUEST message.

In order to initiate the 5G ProSe direct link establishment procedure, the initiating UE shall create a PROSE DIRECT LINK ESTABLISHMENT REQUEST message. The initiating UE:

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

b) shall include the ProSe identifier(s) received from upper layer if the 5G ProSe direct link establishment procedure is not for 5G ProSe direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE;

c) shall include the target user info set to the target UE's application layer ID if received from upper layers, or to the identity of the 5G ProSe UE-to-network relay UE obtained during the 5G ProSe UE-to-network relay discovery procedure, or if the destination layer-2 ID is the unicast layer-2 ID of target UE;

d) if the 5G ProSe direct link is not for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE:

1) shall include the key establishment information container if the UE PC5 unicast signalling integrity protection policy is set to "Signalling integrity protection required" or "Signalling integrity protection preferred" and may include the key establishment information container if the UE PC5 unicast signalling integrity protection policy is set to "Signalling integrity protection not needed";

NOTE 2: The key establishment information container is provided by upper layers.

e) shall include:

1) a Nonce\_1, if the direct communication is not between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE, or if the direct communication is between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE and the security procedure over control plane is used as specified in 3GPP TS 33.503 [34]; or

2) a KNRP freshness parameter 1, if the direct communication is between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE and the security procedure over user plane is used as specified in 3GPP TS 33.503 [34];

 set to the 128-bit nonce value generated by the initiating UE for the purpose of session key establishment over this 5G ProSe direct link if the UE PC5 unicast signalling integrity protection policy is set to "Signalling integrity protection required" or "Signalling integrity protection preferred";

NOTE 3: The Nonce\_1 IE in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message is used to hold the value of Nonce\_1 or KNRP freshness parameter 1.

f) shall include its UE security capabilities indicating the list of algorithms that the initiating UE supports for the security establishment of this 5G ProSe direct link;

g) shall include theMSB of KNRP-sess ID chosen by the initiating UE as specified in 3GPP TS 33.503 [34] if the UE PC5 unicast signalling integrity protection policy is set to "Signalling integrity protection required" or "Signalling integrity protection preferred";

h) may include a KNRP ID if the initiating UE has an existing KNRP for the target UE;

i) shall include its UE PC5 unicast signalling security policy. In the case where the different ProSe applications are mapped to the different PC5 unicast signalling security policies, when the initiating UE intends to establish a single unicast link that can be used for more than one ProSe application, each of the signalling security polices of those ProSe applications shall be compatible, e.g., "Signalling integrity protection not needed" and "Signalling integrity protection required" are not compatible. In case the 5G ProSe direct link establishment procedure is for direct communication between 5G ProSe remote UE and 5G ProSe UE-to-network relay UE, the Signalling integrity protection policy shall be set to "Signalling integrity protection required";

j) shall include the Relay service code IE set to the relay service code of the target relay UE if the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE;

k) shall include the UTC-based counter LSB set to the four least significant bits of the UTC-based counter if the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE;

l) shall include the UE identity IE set to the SUCI of the initiating UE if:

1) the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE; and

2) the security for 5G ProSe UE-to-network relay uses the security procedure over control plane and the initiating UE does not have a valid 5GPRUK as specified in 3GPP TS 33.503 [34], or, the security for 5G ProSe UE-to-network relay uses the security procedure over user plane and the initiating UE does not have a valid PRUK as specified in 3GPP TS 33.503 [34];

m) shall include the User security key ID IE set to:

1) PRUK ID of the initiating UE if:

i) the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE;

ii) the initiating UE has a valid PRUK; and

iii) the security for 5G ProSe UE-to-network relay uses the security procedure over user plane as specified in 3GPP TS 33.503 [34]; or

2) 5GPRUK ID of the initiating UE if:

i) the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE;

ii) the initiating UE has a valid 5GPRUK; and

iii) the security for 5G ProSe UE-to-network relay uses the security procedure over control plane as specified in 3GPP TS 33.503 [34]; and

n) shall include the HPLMN ID of the initiating UE, if the PRUK ID of the initiating UE does not contain the HPLMN ID of the initiating UE or the routing information to the 5G PKMF of the initiating UE.

Editor's note: It is FFS how the UE determines whether the security for 5G ProSe layer-3 relay uses the security procedure over control plane or the security procedure over user plane as specified in 3GPP TS 33.503 [34].

After the PROSE DIRECT LINK ESTABLISHMENT REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the source layer-2 ID and destination layer-2 ID as follows:

a) if the 5G ProSe direct communication is in a consequence of 5G ProSe direct discovery as defined in clause 6.2.14, clause 6.2.15, and clause 8.2.1:

 self-assign a source layer-2 ID, and the destination layer-2 ID set to the source layer-2 ID in the received PROSE PC5 DISCOVERY message for discovery procedure; or

b) otherwise:

 self-assign a source layer-2 ID, and the destination layer-2 ID set to the destination layer-2 ID used for unicast initial signalling as specified in clause 5.2.4,

NOTE 4: The UE implementation ensures that any value of the self-assigned source layer-2 ID in a) and b) is different from any other self-assigned source layer-2 ID(s) in use for 5G ProSe direct discovery as specified in clause 6.2.14, clause 6.2.15 and clause 8.2.1, and is different from any other provisioned destination layer-2 ID(s) as specified in clause 5.2.

NOTE 5: It is possible for the initiating UE to reuse the initiating UE's layer-2 ID used in previous 5G ProSe direct link with the same peer UE.

and start timer T5080.

NOTE 6: A default PC5 DRX configuration is used for transmitting this message as specified in 3GPP TS 38.300 [21].

The UE shall not send a new PROSE DIRECT LINK ESTABLISHMENT REQUEST message to the same target UE identified by the same application layer ID while timer T5080 is running. If the target user info IE is not included in the PROSE DIRECT LINK ESTABLISHMENT REQUEST message (i.e., ProSe application oriented 5G ProSe direct link establishment procedure), the initiating UE shall handle multiple PROSE DIRECT LINK ESTABLISHMENT ACCEPT messages, if any, received from different target UEs for the establishment of multiple 5G ProSe direct links before the expiry of timer T5080.

NOTE 7: In order to ensure successful 5G ProSe direct link establishment, T5080 should be set to a value larger than the sum of T5089 and T5092.



Figure 7.2.2.2.1: UE oriented 5G ProSe direct link establishment procedure



Figure 7.2.2.2.2: ProSe service oriented 5G ProSe direct link establishment procedure

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

#### 10.3.1.1 Message definition

This message is sent by a UE to another peer UE to establish a direct link. See table 10.3.1.1.1.

Message type: PROSE DIRECT LINK ESTABLISHMENT REQUEST

Significance: dual

Direction: UE to peer UE

Table 10.3.1.1.1: PROSE DIRECT LINK ESTABLISHMENT REQUEST message content

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | PROSE DIRECT LINK ESTABLISHMENT REQUEST message identity | ProSe PC5 signalling message type11.3.1 | M | V | 1 |
|  | Sequence number | Sequence number11.3.2 | M | V | 1 |
|  | Source user info | Application layer ID11.3.4 | M | LV | 2-256 |
|  | UE security capabilities | UE security capabilities11.3.11 | M | LV | 3-9 |
|  | UE PC5 unicast signalling security policy | UE PC5 unicast signalling security policy11.3.12 | M | V | 1 |
| 7B | ProSe identifiers | ProSe identifier11.3.3 | O | TLV-E | 21-65538 |
| 74 | Key establishment information container | Key establishment information container11.3.9 | O | TLV-E | 4-65538 |
| 56 | Nonce\_1 | Nonce11.3.10 | O | TV | 17 |
| 5C | MSB of KNRP-sess ID | MSB of KNRP-sess ID11.3.13 | O | TV | 2 |
| 28 | Target user info | Application layer ID11.3.4 | O | TLV | 3-257 |
| 58 | KNRP ID | KNRP ID11.3.14 | O | TV | 5 |
| 54 | Relay service code | Relay service code11.3.26 | O | TV | 4 |
| 7D | UE identity | 5GS mobile identity11.3.30 | O | TLV-E | 4-n |
| 64 | User security key ID | User security key ID11.3.32 | O | TLV | 3-n |
| 2A | HPLMN ID | PLMN ID11.3.33 | O | TV | 4 |
| 2B | UTC-based counter LSB | UTC-based counter LSB11.2.14 | O | TV | 2 |

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

#### 10.3.1.10 User security key ID

The UE shall include this IE if the 5G ProSe direct link establishment procedure is for direct communication between the 5G ProSe remote UE and the 5G ProSe UE-to-network relay UE, and:

a) the security procedure over user plane for 5G ProSe UE-to-network relay is used as specified in 3GPP TS 33.503 [34] and the UE has a valid PRUK; or

b) the security procedure over control plane for 5G ProSe UE-to-network relay is used as specified in 3GPP TS 33.503 [34] and the UE has a valid 5GPRUK.

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

### 11.3.32 User security key ID

The purpose of the User security key ID information element is to carry the identity of the PRUK or the 5GPRUK.

The User security key ID is a type 4 information element with a minimal length of 3 octets and a maximum length of 255 octets.

The User security key ID information element is coded as shown in figure 11.3.32.1 and table 11.3.32.1.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| User security key ID IEI | octet 1 |
| Length of User security key ID contents | octet 2 |
| 0Spare | 0Spare | 0Spare | 0Spare | User security key ID format | User security key ID type | octet 3 |
| User security key ID | octet 4octet n |

Figure 11.3.32.1: User security key ID information element

Table 11.3.32.1: User security key ID information element

|  |
| --- |
| User security key ID type (bit 1 to 3 of octet 3) |
| The user security key ID type indicates the type of the user security key ID. |
| Bits |
| **3** | **2** | **1** |  |  |
| 0 | 0 | 1 |  | PRUK ID |
| 0 | 1 | 0 |  | 5GPRUK ID |
| All other values are reserved. |
|  |
| User security key ID format (bit 4 of octet 3) (NOTE) |
| Bit |
| **4** |  |
| 0 | network access identifier (NAI) |
| 1 | 64-bit string |
| Bits 5 to 8 of octet 3 are spare and shall be coded as zero. |
| User security key ID (octet 4 to octet n)The user security key ID field contains the PRUK ID or the 5GPRUK ID. If the user security key ID format field indicates "NAI", the PRUK ID or the 5GPRUK ID in the user security key ID field is in the NAI format as defined in 3GPP TS 23.003 [12], encoded as UTF-8 string. If the user security key ID format field indicates "64-bit string", the PRUK ID in the user security key ID field is a 64-bit string, encoded using binary encoding. |
|  |
| NOTE: When user security key ID type is set to 5GPRUK ID, the user security key ID format shall be always set to "NAI". |

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