**3GPP TSG-CT WG1 Meeting #128-eC1-21xxxx was C1-210862 was C1-207248**

**Electronic meeting, 25 February - 05 March 2021**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **24.587** | **CR** | **0158** | **rev** | **2** | **Current version:** | **16.3.0** |  |
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| *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:***  | PC5 unicast link establishment for broadcast |
|  |  |
| ***Source to WG:*** | CATT, Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2021-02-03 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)* |
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| ***Reason for change:*** | 1. During PC5 unicast link establishment procedure, it is emphasized that the target UE’s layer-2 ID is used for broadcast or unicast and Target User Info shall be included when unicast Layer-2 ID is included in the Direct Communication Request message in TS 23.287 v16.4.0:

“…..3. UE-1 sends a Direct Communication Request message to initiate the unicast layer-2 link establishment procedure. The Direct Communication Request message includes:- Source User Info: the initiating UE's Application Layer ID (i.e. UE-1's Application Layer ID).- If the V2X application layer provided the target UE's Application Layer ID in step 2, the following information is included:- Target User Info: the target UE's Application Layer ID (i.e. UE-2's Application Layer ID).- V2X Service Info: the information about V2X service type(s) requesting Layer-2 link establishment.- Security Information: the information for the establishment of security.NOTE 1: The Security Information and the necessary protection of the Source User Info and Target User Info are defined in TS 33.536 [26]. The source Layer-2 ID and destination Layer-2 ID used to send the Direct Communication Request message are determined as specified in clauses 5.6.1.1 and 5.6.1.4. The destination Layer-2 ID may be broadcast or unicast Layer-2 ID. When unicast Layer-2 ID is used, the Target User Info shall be included in the Direct Communication Request message. UE-1 sends the Direct Communication Request message via PC5 broadcast or unicast using the source Layer-2 ID and the destination Layer-2 ID.……”But the description is missing in Stage 3.1. As the optional IE, the Target user info should be 1 octet longer than the mandatory Source user info IE whose Type is Application layer ID.
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| ***Summary of change:*** | 1. target UE’s layer-2 ID in the Direct Link Establishment Request message may be used for broadcast.
2. Add a restriction that Target UE Info is mandatory in the Direct Communication Request message.
3. The length of Target user info is changed to 4-254.
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| ***Consequences if not approved:*** | 1. Miss the case that target UE’s layer-2 ID in the Direct Communication Request message may be used for broadcast.
2. It is missed that the restrction condition that Target UE Info is mandatory.
3. The length of Target user info is wrong.
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| ***Clauses affected:*** | 6.1.2.2.2, 7.3.1.1, 7.3.1.2 |
|  |  |
|  | **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:*** | Rev2: The only change in comparision with Rev1 is changing “and” into “or” for the bullet “c) shall include the target user info set to the target UE’s application layer ID if received from upper layers or if the target UE's layer-2 ID is the unicast layer-2 ID;” |

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

##### 6.1.2.2.2 PC5 unicast 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 V2X service over PC5;

b) the communication mode is unicast mode (e.g. pre-configured as specified in clause 5.2.3 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 PC5 unicast 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 5.2.3 or known via prior V2X communication);

NOTE 1: In the case where different V2X services 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 V2X service 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 V2X communication over PC5 in NR-PC5 in the serving PLMN, or has a valid authorization for V2X communication over PC5 in NR-PC5 when not served by E-UTRA and not served by NR. The UE considers that it is not served by E-UTRA and not served by NR if the following conditions are met:

1) not served by NR and not served by E-UTRA for V2X communication over PC5;

2) in limited service state as specified in 3GPP TS 23.122 [2], 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 [9];

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 [6]; 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 [6]; or

3) in limited service state as specified in 3GPP TS 23.122 [2] 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 5.2.3;

f) there is no existing PC5 unicast link for the pair of peer application layer IDs, or there is an existing PC5 unicast link for the pair of peer application layer IDs and:

1) the network layer protocol of the existing PC5 unicast link is not identical to the network layer protocol required by the upper layer in the initiating UE for this V2X service; or

2) the security policy (either signalling security policy or user plane security policy) corresponding to the V2X service identifier is not compatible with the security policy of the existing PC5 unicast link; and

g) the number of established PC5 unicast links is less than the implementation-specific maximum number of established NR PC5 unicast links allowed in the UE at a time.

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 6.1.2.12.

In order to initiate the PC5 unicast link establishment procedure, the initiating UE shall create a 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 V2X service identifier(s) received from upper layer;

c) shall include the target user info set to the target UE’s application layer ID if received from upper layers or if the target UE's layer-2 ID is the unicast layer-2 ID;

d) 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 a Nonce\_1 set to the 128-bit nonce value generated by the initiating UE for the purpose of session key establishment over this PC5 unicast link if the UE PC5 unicast signalling integrity protection policy is set to "signalling integrity protection required" or "signalling integrity protection preferred";

f) shall include its UE security capabilities indicating the list of algorithms that the initiating UE supports for the security establishment of this PC5 unicast link;

g) shall include the 8 MSBs of KNRP-sess ID chosen by the initiating UE as specified in 3GPP TS 33.536 [20] 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; and

i) shall include its UE PC5 unicast signalling security policy. In the case where the different V2X services 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 V2X service, each of the signalling security polices of those V2X services shall be compatible, e.g. "signalling integrity protection not needed" and "signalling integrity protection required" are not compatible.

After the DIRECT LINK ESTABLISHMENT 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 destination layer-2 ID, and start timer T5000. The UE shall not send a new DIRECT LINK ESTABLISHMENT REQUEST message to the same target UE identified by the same application layer ID while timer T5000 is running. If the target user info IE is not included in the DIRECT LINK ESTABLISHMENT REQUEST message (i.e. V2X service oriented PC5 unicast link establishment procedure), the initiating UE shall handle multiple DIRECT LINK ESTABLISHMENT ACCEPT messages, if any, received from different target UEs for the establishment of multiple PC5 unicast links before the expiry of timer T5000.

NOTE 3: In order to ensure successful PC5 unicast link establishment, T5000 should be set to a value larger than the sum of T5006 and T5007.



Figure 6.1.2.2.2: UE oriented PC5 unicast link establishment procedure

Initiating UE

Target UEs

Start T5000

DIRECT LINK ESTABLISHMENT REQUEST

DIRECT LINK ESTABLISHMENT ACCEPT

T5000 expires

DIRECT LINK ESTABLISHMENT ACCEPT

Figure 6.1.2.2.3: V2X service oriented PC5 unicast link establishment procedure

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

#### 7.3.1.1 Message definition

This message is sent by a UE to another peer UE to establish a direct link. See table 7.3.1.1.1.

Message type: DIRECT LINK ESTABLISHMENT REQUEST

Significance: dual

Direction: UE to peer UE

Table 7.3.1.1.1: DIRECT LINK ESTABLISHMENT REQUEST message content

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| IEI | Information Element | Type/Reference | Presence | Format | Length |
|  | DIRECT LINK ESTABLISHMENT REQUEST message identity | PC5 signalling message type8.4.1 | M | V | 1 |
|  | Sequence number | Sequence number8.4.2 | M | V | 1 |
|  | V2X service identifiers | V2X service identifier8.4.3 | M | LV | 5-253 |
|  | Source user info | Application layer ID8.4.4 | M | LV | 3-253 |
|  | UE security capabilities | UE security capabilities8.4.14 | M | LV | 3-9 |
|  | UE PC5 unicast signalling security policy | UE PC5 unicast signalling security policy8.4.15 | M | V | 2 |
| 74 | Key establishment information container | Key establishment information container8.4.12 | O | TLV-E | 4-n |
| 53 | Nonce\_1 | Nonce8.4.13 | O | TV | 17 |
| 54 | MSBs of KNRP-sess ID | MSBs of KNRP-sess ID8.4.16 | O | TV | 2 |
| 28 | Target user info | Application layer ID8.4.4 | O | TLV | 43-254 |
| 52 | KNRP ID | KNRP ID8.4.17 | O | TV | 5 |

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

#### 7.3.1.2 Target user info

The UE shall include this IE if it has received the target UE’s application layer ID from upper layers or if the target UE's layer-2 ID is the unicast layer-2 ID.

\*\*\*\*\* End of change \*\*\*\*\*