**3GPP TSG-CT WG1 Meeting #123-eC1-202848**

**Electronic meeting, 16-24 April 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **24.587** | **CR** | **0029** | **rev** | **1** | **Current version:** | **16.0.0** |  |
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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:***  | Maximum number of NR PC5 unicast links for a UE |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2020-03-28 |
|  |  |  |  |  |
| ***Category:*** | **C** |  | ***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)* |
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| ***Reason for change:*** | As discussed in the discussion paper C1-202416 due to storage limitation, number of PC5 unicast links that the UE needs to support at a time needs to be limited. |
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| ***Summary of change:*** | 1. Define the maximum number of NR PC5 unicast links allowed for a UE at a time;
2. Add a new pre-condition that initiating UE has to meet before triggering the PC5 unicast link establishment procedure;
3. Add a new cause value to indicate the reject reason is the target UE has reached its maximum number of NR PC5 unicast links.
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| ***Consequences if not approved:*** | Unspecified UE behaviour when the hardware resource to support a new unicast link is not enough. |
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| ***Clauses affected:*** | 6.1.2.2.1, 6.1.2.2.2,6.1.2.2.5 |
|  |  |
|  | **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 \* \* \* \*

6.1.2.2.1 General

The PC5 unicast link establishment procedure is used to establish a PC5 unicast link between two UEs. The UE sending the request message is called the "initiating UE" and the other UE is called the "target UE". The maximum number of NR PC5 unicast links established in a UE at a time shall not exceed an implementation-specific maximum number of established NR PC5 unicast links.

NOTE: It is recommended to have an implementation-specific maximum number of established NR PC5 unicasts link not exceeding 8.

Editor’s note: The details about security procedure defined by SA3 are FFS.

Editor’s note: The details of the IEs of the following messages are FFS.

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

6.1.2.2.2 PC5 unicast link establishment procedure initiation by initiating UE

Editor’s note: This section needs to be revisited after SA3 have determined the full set of security requirements for unicast link establishment.

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 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);

c) the link layer identifier for the unicast initial signaling (i.e. destination layer 2 ID used for unicast initial signaling) is available to the initiating UE (e.g. pre-configured, obtained as specified in clause 5.2.3 or known via prior V2X communication);

d) the initiating UE is either authorised for V2X communication over PC5 in NR in the serving PLMN, or has a valid authorization for V2X communication over PC5 in NR when not served by E-UTRAN and not served by NR; and

e) there is no existing PC5 unicast link for the pair of peer application layer IDs and the network layer protocol of this PC5 unicast link are identical to those required by the upper layer in the initiating UE for this V2X service.

f) 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.

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 received from upper layer;

c) may include the target user info set to the target UE’s application layer ID if received from upper layers; and

d) shall include the security establishment information.

Editor’s note: The parameters in the security establishment information will be defined by SA3.

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 used for unicast initial signaling, 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.

**Figure 6.1.2.2.2: PC5 unicast link establishment procedure**

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

6.1.2.2.5 PC5 unicast link establishment procedure not accepted by the target UE

If the DIRECT LINK ESTABLISHMENT REQUEST message cannot be accepted, the target UE shall send a DIRECT LINK ESTABLISHMENT REJECT message. The 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 proposed link; or

#111 protocol error, unspecified.

If the target UE is not allowed to accept this request .e.g. based on operator policy or service authorisation provisioning, the target UE shall send a DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #1 "direct communication to the target UE not allowed".

For a received DIRECT LINK ESTABLISHMENT REQUEST message from a Layer 2 ID (for unicast communication), if the target UE already has an existing link established to the UE known to use this Layer 2 ID or is currently processing a DIRECT LINK ESTABLISHMENT REQUEST message from the same Layer 2 ID, but with user info different from the user info IE included in this new incoming message, the target UE shall send a DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #3 "conflict of Layer 2 ID for unicast communication is detected".

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

For other reasons that causing the failure of link establishment, the target UE shall send a DIRECT LINK ESTABLISHMENT REJECT message containing PC5 signalling protocol cause value #111 "protocol error, unspecified".

Upon receipt of the DIRECT LINK ESTABLISHMENT REJECT message, the initiating UE shall stop timer T5000 and abort the PC5 unicast link establishment procedure. If the PC5 signalling protocol cause value in the DIRECT LINK ESTABLISHMENT REJECT message is #1 "direct communication to the target UE not allowed" or #5 "lack of resources for proposed link", then the UE shall not attempt to start PC5 unicast link establishment with the same target UE at least for a time period T.

NOTE: 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 proposed link".

\* \* \* End of Change \* \* \* \*