**3GPP TSG-CT WG1 Meeting #125-eC1-204561**

**Electronic meeting, 20-28 August 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **24.587** | **CR** | **0073** | **rev** | **-** | **Current version:** | **16.1.1** |  |
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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:***  | UE in limited service state for unicast |
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| ***Source to WG:*** | OPPO |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2020-7-28 |
|  |  |  |  |  |
| ***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)* |
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| ***Reason for change:*** | 1. In subclause 5.7 “Support for V2X communication for UEs in limited service state” in TS 23.287 16.3.0, how to determine whether UE in limited service state can do V2X communications is specified. This applies to PC5 interface no matter which mode is used.

In TS 24.587, UE behaviours in limited service state for broadcast and groupcast have been specified. Howerver, for unicast, such description is missing.UE in limited service state determines whether to use unicast communication over PC5 when the direce link should be established.Therefore, the condition of establishing direct link is a good place to change.1. Wrong bullet number in 6.1.3.2.1.1.
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| ***Summary of change:*** | 1. Add limited service state in conditions of direct link establishment.
2. Correct the wrong bullet number in 6.1.3.2.1.1.
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| ***Consequences if not approved:*** | 1. Determining whether PC5 communication can be used by UE in limited service state is missing in the pre-conditions of direct link establishment.
2. Wrong bullet number in 6.1.3.2.1.1.
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| ***Clauses affected:*** | 6.1.2.2.2, 6.1.3.2.1.1 |
|  |  |
|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\*\*\* First of 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 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 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);

NOTE: 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 types, 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. 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 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.

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;

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 1: 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.

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.

NOTE 2: 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: PC5 unicast link establishment procedure

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

###### 6.1.3.2.1.1 Requirements for V2X communication over PC5

When the upper layers request the UE to send a V2X message of a V2X service identified by a V2X service identifier using V2X communication over PC5, the request from the upper layers includes:

a) the V2X message;

b) the V2X service identifier of the V2X service for the V2X message;

c) the type of data in the V2X message (i.e. IP or non-IP);

d) if the V2X message contains non-IP data, the V2X message family (see clause 9.2.1) of data in the V2X message;

e) optionally the communication mode which is set to broadcast mode; and

f) optionally the V2X application requirements (e.g. priority requirement, reliability requirement, delay requirement).

Upon a request from upper layers to send a V2X message of a V2X service identified by a V2X service identifier using V2X communication over PC5, if:

a) the UE is configured with V2X service identifier to V2X frequency mapping rules for V2X communication over PC5 as specified in clause 5.2.3; and

b) there is one or more V2X frequencies associated with the V2X service identifier of the V2X service for the V2X message in the current geographical area,

then the UE passes the one or more V2X frequencies associated with the V2X service identifier of the V2X service and the communication mode which is set to broadcast mode for the V2X message to the lower layers.

Then, if any of the following conditions are met:

a) the following conditions are met:

1) the UE is served by NR or served by E-UTRA for NR-PC5 V2X communication;

2) the UE intends to use the radio resources (i.e. carrier frequency) provided by a serving cell;

3) the registered PLMN is in the list of PLMNs in which the UE is authorized to use V2X communication over PC5 when the UE is served by NR or served by E-UTRA for V2X communication over PC5 as specified in clause 5.2.3; and

4) the V2X service identifier of the V2X service is included in the list of V2X services authorized for V2X communication over PC5 as specified in clause 5.2.3 or the UE is configured with a default destination layer-2 ID for V2X communication over PC5 as specified in clause 5.2.3;

b) the following conditions are met:

1) the UE is:

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

ii) 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;

A) the UE is unable to find a suitable cell in the selected PLMN as specified in 3GPP TS 38.304 [9];

B) 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

C) 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

iii) in limited service state as specified in 3GPP TS 23.122 [2] for reasons other than A), B) or C) 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;

2) the UE is authorized to use V2X communication over PC5 when the UE is not served by NR or not served by E-UTRA for V2X communication as specified in clause 5.2.3; and

3) the V2X service identifier of the V2X service is included in the list of V2X services authorized for V2X communication over PC5 as specified in clause 5.2.3 or the UE is configured with a default destination layer-2 ID for V2X communication over PC5 as specified in clause 5.2.3;

then the UE shall proceed as specified in clause 6.1.3.2.1.2, else the UE shall not perform transmission of V2X communication over PC5.

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