**3GPP TSG-CT WG1 Meeting #126-eC1-206xxx was C1-206202**

**Electronic meeting, 15-23 October 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **24.587** | **CR** | **0132** | **rev** | **1** | **Current version:** | **16.2.1** |  |
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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 | **X** |

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| ***Title:***  | V2X message family encoding |
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| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2020-09-22 |
|  |  |  |  |  |
| ***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:*** | To support V2X application, different standard organization such as IEEE, ISO, ETSI and CCSA defines respective V2X message format and corresponding different V2X application type identification. In 4G V2X, TS 24.386 assignes a value for each V2X message family to exclusively identify a V2X message family. It is proposed to follow the encoding of V2X message family proposed in 4G V2X for the sake of consistency and interoperability between 4G and 5G V2X. Moreover, considering future-proof, we suggest to define the V2X message familiy in 5G.  |
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| ***Summary of change:*** | Specify the encoding of V2X message family in alignment with 4G V2X. |
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| ***Consequences if not approved:*** | The encoding of V2X message family is missing. |
|  | ,  |
| ***Clauses affected:*** | 6.1.3.2.1.1, 6.1.3.2.2, 6.2.2, 6.2.5, 9.x |
|  |  |
|  | **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 \*\*\*\*\*

###### 6.1.3.2.1.1 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.x) 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 and 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

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

##### 6.1.3.2.2 Transmission

The UE shall include the V2X message in a protocol data unit with the following parameters:

a) a layer-3 protocol data unit type (see 3GPP TS 38.323 [10]) set to:

1) IP packet, if the V2X message contains IP data; or

2) non-IP packet, if the V2X message contains non-IP data;

b) the source layer-2 ID set to the layer-2 ID self-assigned by the UE for V2X communication over PC5;

c) the destination layer-2 ID set to:

1) the destination layer-2 ID associated with the V2X service identifier of the V2X service in this list of V2X services authorized for V2X communication over PC5 as specified in clause 5.2.3, if 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

2) the default destination layer-2 ID configured to the UE for V2X communication over PC5 as specified in clause 5.2.3, if the V2X service identifier of the V2X service is not included in the list of V2X services authorized for V2X communication over PC5 and the UE is configured with a default destination layer-2 ID for V2X communication over PC5;

d) if the V2X message contains non-IP data, an indication to set the non-IP type field of the non-IP type PDU to the value corresponding to the V2X message family (see clause 9.x) used by the V2X service as indicated by upper layers;

e) if the V2X message contains IP data, the source IP address set to the source IP address self-assigned by the UE for V2X communication over PC5;

f) the PQFI set to the value corresponding to the PC5 QoS Rules as specified in clause 6.1.3.2.1;

g) if the UE is configured with V2X service identifier to Tx Profile mapping rules for V2X communication over PC5 as specified in clause 5.2.3, the Tx Profile associated with the V2X service identifier as specified in clause 5.2.3.

then UE shall request radio resources for V2X communication over PC5 as specified in 3GPP TS 38.300 [8], and pass the V2X message on the PC5 QoS Flow identified by the PQFI to lower layers for transmission. The PC5 QoS Rules corresponding to the PQFIs map V2X messages with the same V2X service identifier and with the same PC5 QoS parameters to the same PC5 QoS Flow, and apply PQFI to V2X messages;

If the UE is camped on a serving cell indicating that V2X communication over PC5 is supported by the network, but not broadcasting any carrier frequencies and radio resources for V2X communication over PC5 as specified in 3GPP TS 38.331 [11], the UE shall request radio resources for V2X communication over PC5 as specified in 3GPP TS 24.501 [6].

If the UE has an emergency PDN connection, the UE shall send an indication to the lower layers to prioritize transmission over the emergency PDN connection as compared to transmission of V2X communication over PC5.

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

### 6.2.2 Transmission of V2X communication over Uu from UE to V2X application server

The upper layers can request the UE to send a V2X message of a V2X service identified by a V2X service identifier using V2X communication over Uu. 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 (IP or non-IP); and

d) if the V2X message contains non-IP data, the V2X message family (see clause 9.x) of data in the V2X message.

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 Uu:

a) if the registered PLMN of the UE is not in the list of PLMNs in which the UE is configured to use V2X communication over Uu as specified in clause 5.2.4, the UE shall determine that the transmission of V2X communication over Uu from UE to V2X application server is not configured and shall not continue with the rest of the steps; and

b) if the V2X service identifier is included in the list of V2X service identifier to PDU session parameters mapping rules specified in clause 5.2.4;

 then:

1) the UE shall determine the mapping rule in the list of V2X service identifier to PDU session parameters mapping rules specified in clause 5.2.4, such that the mapping rule contains the V2X service identifier provided by upper layers;

2) the UE shall consider the PDU session type, the SSC mode (if indicated in determined mapping rule), an S-NSSAI (if indicated in determined mapping rule) and a DNN (if indicated in determined mapping rule) indicated in the determined mapping rule as the UE local configuration and request information of the PDU session via which to send a PDU according to 3GPP TS 24.526 [22]. The UE shall use the transport layer protocol, if indicated in the determined mapping rule, to transport the V2X message;

3) if the PDU session is of "IPv4", "IPv6" or "IPv4v6" PDU session type:

i) if the V2X service identifier is included in the list of V2X service identifier to V2X application server address mapping rules as specified in clause 5.2.4, then:

A) the UE shall discover the V2X application server address for uplink transport as described in clause 6.2.6. If the V2X application server address cannot be discovered, the UE shall determine that the transmission of V2X communication over Uu from UE to V2X application server is not possible and shall not continue with the rest of the steps;

B) if UDP is to be used for the determined V2X application server address, the UE shall generate a UDP message as described in IETF RFC 768 [14]. In the UDP message, the UE shall include the V2X message provided by upper layers in the data octets field. The UE shall send the UDP message to the determined V2X application server address; and

C) if TCP is to be used for the determined V2X application server address:

1) if a TCP connection with the determined V2X application server address is not established yet, the UE shall establish a TCP connection with the determined V2X application server address; and

2) the UE shall generate one or more TCP message(s) as described in IETF RFC 793 [25]. In the one or more TCP message(s), the UE shall include the V2X message provided by upper layers in the data octets filed. The UE shall send the one or more TCP message(s) to the determined V2X application server address via the TCP connection; and

4) if the PDU session is of "Unstructured" PDU session type and the type of data in the V2X message is non-IP, the UE shall generate a UDP message as described in IETF RFC 768 [14]. In the UDP message, the UE shall encapsulate the V2X message provided by upper layers in the data octets field. The UE shall send the UDP message to the determined V2X application server address.

\*\*\*\*\* Fourth change \*\*\*\*\*

### 6.2.5 Reception of V2X communication over Uu from V2X application server to UE

The upper layers can request the UE to receive a V2X message of a V2X service identified by a V2X service identifier using V2X communication over Uu. The request from the upper layers includes:

a) the V2X service identifier of the V2X service for the V2X message to be received;

b) the type of data in the V2X message to be received (IP or non-IP); and

c) if the V2X message to be received contains non-IP data, the V2X message family (see clause 9.x) of data in the V2X message to be received.

Upon a request from upper layers to receive a V2X message of a V2X service identified by a V2X service identifier using V2X communication over Uu:

a) if the registered PLMN of the UE is not in the list of PLMNs in which the UE is configured to use V2X communication over Uu as specified in clause 5.2.4, the UE shall determine that the transmission of V2X communication over Uu from V2X application server to UE is not configured and shall not continue with the rest of the steps; and

b) if the V2X service identifier is included in the list of V2X service identifier to PDU session parameters mapping rules specified in clause 5.2.4;

 then:

1) the UE shall determine the mapping rule in the list of V2X service identifier to PDU session parameters mapping rules specified in clause 5.2.4, such that the mapping rule contains the V2X service identifier provided by upper layers;

2) the UE shall establish a PDU session with the PDU session type, the SSC mode (if indicated in determined mapping rule), an S-NSSAI (if indicated in determined mapping rule) and a DNN (if indicated in determined mapping rule) indicated in the determined mapping rule, if such PDU session does not exist yet. The UE shall use the transport layer protocol, if indicated in the determined mapping rule, to receive the V2X message;

3) if the PDU session is of "IPv4", "IPv6" or "IPv4v6" PDU session type:

i) if the V2X service identifier is included in the list of V2X service identifier to V2X application server address mapping rules as specified in clause 5.2.4, then:

A) the UE shall discover the V2X application server address for downlink transport as described in clause 6.2.6. If the V2X application server address cannot be discovered, the UE shall determine that the transmission of V2X communication over Uu from V2X application server to UE is not possible and shall not continue with the rest of the steps. If the V2X service identifier is not included in the list of V2X service identifier to V2X application server address mapping rules as specified in clause 5.2.4, the UE shall continue with the rest of the steps; and

B) if UDP is to be used for the determined V2X application server address:

1) the UE shall select the UDP port for downlink transport based on configuration parameters for V2X communication as defined in clause 5.2.4; and

2) the UE shall listen for UDP packets over the determined UDP port, and provide the UDP packets to the upper layers if received; and

C) if TCP is to be used for the determined V2X application server address:

1) if a TCP connection with the determined V2X application server address is not established yet, the UE shall establish a TCP connection with the determined V2X application server address; and

2) the UE shall listen for TCP packets over the established TCP connection, and provide the TCP packets to the upper layers if received; and

4) if the PDU session is of "Unstructured" PDU session type and the type of data in the V2X message is non-IP, the UE shall proceed as UDP is to be used for the determined V2X application server address with the exeption that the V2X message is encapsulated as IP type data packets.

\*\*\*\*\* Fifth change \*\*\*\*\*

## 9.x V2X message family encoding

The values are specified to identify the V2X message family according to table 9.x.1.

Table 9.x.1: V2X message family

|  |
| --- |
| V2X message family (octet 4)Bits |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | IEEE 1609, see IEEE 1609.3 [13] |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | ISO, see ISO 29281-1 [17] |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | ETSI-ITS, see ETSI EN 302 636-3 [12] |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | CCSA, see CCSA YD/T 3707-2020 [24] |
| All other values are reserved.  |

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