**GPP TSG-CT Meeting #89eCP-202XXX**

**E-Meeting, 14th – 16th September 2020 (was C1-205184)**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **24.587** | **CR** | **0115** | **rev** | **2** | **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 | **X** |

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| ***Title:***  | Correction to V2X communication over Uu between the UE and the application server |
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| ***Source to WG:*** | Huawei, Hisilicon |
| ***Source to TSG:*** | Huawei, Hisilicon |
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| ***Work item code:*** | eV2XARC |  | ***Date:*** | 2020-09-14 |
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| ***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:*** | The specification mandates to both the UE and the application server to implement an “envelope” mechanism (V2X envelope) which is in fact not supported by stage 2 requirements and it is unnecessary for the V2X services to work.Additionally, please note that in TS 23.287 clause 5.2.3.1, following statements exist, quote:*[..] when Unstructured PDU Session type is used for transport of non-IP based V2X messages:**- V2X messages are transported to the V2X Application Server as defined in clause 5.6.10.3 of TS 23.501 [6].*Also, in TS 23.501 clause 5.6.10.3, following statements exist:*5.6.10.3 Support of Unstructured PDU Session type**Different Point-to-Point (PtP) tunnelling techniques may be used to deliver Unstructured PDU Session type data to the destination (e.g. application server) in the Data Network via N6.**Point-to-point tunnelling based on UDP/IP encapsulation as described below may be used. Other techniques may be supported. Regardless of addressing scheme used from the UPF to the DN, the UPF shall be able to map the address used between the UPF and the DN to the PDU Session.*Seeing the above stage 2 requirements, the only explicit way in 3GPP to realize Unstructured PDU Session type is to encapsulate the unstrutured data into UDP/IP.Further details for the removal of the mandatory and unnecessary “envelope” mechanism to UE and application server implementations are provided by C1-205161. |
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| ***Summary of change:*** | 1. The UE shall encapsulate V2X service data of unstrutured PDU session type as IP type in UDP message, and use the mechanism of UDP to transfer the V2X service data;
2. TCP connections are established by the UE or the V2X application server if no TCP connection exists, to send and receive TCP messages with V2X service data included.
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| ***Consequences if not approved:*** | Redundant, unnecessary protocol stack is mandated to both UE implementations and for V2X application server implementations. The specification is not aligned with stage 2 requirements. Interoperability with EPS-based implementations do not work. |
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| ***Clauses affected:*** | 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.5, 9.2.1 |
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|  | **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:*** |  |
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| ***This CR's revision history:*** | Revision 1 (CT1#125-e): * Editorial corrections.

Revision 2 (CT#89-e): * Note added in 6.2.1
* Changed ‘TCP message’ to ‘one of more TCP messages(s)’ in 6.2.2 and 6.2.3
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\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

[3] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[4] 3GPP TS 23.502: "Procedures for the 5G System (5GS); Stage 2".

[5] 3GPP TS 24.386 "User Equipment (UE) to V2X control function; protocol aspects; Stage 3".

[6] 3GPP TS 24.501: "Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[7] 3GPP TS 24.588: "Vehicle-to-Everything (V2X) services in 5G System (5GS); User Equipment (UE) policies; Stage 3".

[8] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[9] 3GPP TS 38.304: "User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[10] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[11] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[12] ETSI EN 302 636-3 v1.2.1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network Architecture".

[13] IEEE 1609.3 2016: "IEEE Standard for Wireless Access in Vehicular Environments (WAVE) -- Networking Services".

[14] IETF RFC 768: "User Datagram Protocol".

[15] IETF RFC 4291: "IP Version 6 Addressing Architecture".

[16] IETF RFC 4862: "Neighbor Discovery for IP version 6 (IPv6)".

[17] ISO 29281-1 2013: "Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 1: Fast networking & transport layer protocol (FNTP)".

[18] ISO TS 17419 ITS-AID AssignedNumbers: <http://standards.iso.org/iso/ts/17419/TS17419%20Assigned%20Numbers/TS17419_ITS-AID_AssignedNumbers.pdf>

[19] IETF RFC 1035: "DOMAIN NAMES - IMPLEMENTATION AND SPECIFICATION".

[20] 3GPP TS 33.536: "Security aspects of 3GPP support for advanced Vehicle-to-Everything (V2X) services".

[21] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[22] 3GPP TS 24.526: "User Equipment (UE) policies for 5G System (5GS); Stage 3".

[23] ISO/IEC 10118-3:2018: "IT Security techniques – Hash-functions – Part 3: Dedicated hash-functions".

[24] CCSA YD/T 3707-2020: "Technical requirements of network layer of LTE-based vehicular communication".

[rfc793] IETF RFC 793: "Transmission Control Protocol."

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

### 6.2.1 General

This clause describes the procedures at the UE and the V2X application server, for V2X communication over Uu.

There are no additional security or privacy procedures of V2X communication over Uu beyond those specified in 3GPP TS 33.501 [21] for Uu connectivity with 5GCN.

Both IP based and non-IP based V2X communication over Uu are supported.

V2X messages carried over Uu are sent or received over unicast only in this release of the specification. Furthermore, V2X messages are carried over Uu using user data over user plane. For this, the UE first performs the UE-requested PDU session establishment procedure to establish user-plane resouces as specified in 3GPP TS 24.501 [6].

Procedures for V2X communication over Uu for V2X services not identified by a V2X service identifier are out of scope of the present version of the present specification.

NOTE: The upper layers are responsible for re-assembly of V2X messages and that is out of scope of 3GPP.

\* \* \* Next 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 7.1 of 3GPP TS 24.386 [5]) 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:

1) the type of data in the V2X message is non-IP; or

2) the type of data in the V2X message is IP, and the V2X service identifier is not included in the list of V2X service identifiers of the V2X services configured for V2X communication over Uu using existing unicast routing as 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];

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

i) 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;

ii) 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

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

A) 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

B) the UE shall generate one or more TCP message(s) as described in IETF RFC 793 [rfc793]. 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..

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

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

If the V2X application server is configured with one or more UDP ports for uplink transport or one or more TCP ports for bidirectional transport, of V2X message(s) of V2X service(s) identified by V2X service identifier(s) using the V2X communication over Uu as specified in clause 6.2.7:

1) if the V2X application server is configured with a UDP port for uplink transport, the V2X application server shall extract a V2X message of the V2X service from a UDP message received on a local IP address and a UDP port; and

2) if the V2X application server is configured with a TCP port for bidirectional transport, the V2X application server shall listen for incoming TCP connection(s) on a local IP address and the TCP port, shall accept the incoming TCP connection(s), shall receive one or more TCP message(s)via the accepted TCP connection(s) and shall extract a V2X message of the V2X service from the received one or more TCP message(s).

If the V2X application server is configured to handle data of "Unstructured" PDU Session type for transport of V2X message(s) of V2X service(s) identified by V2X service identifier(s) using V2X communication over Uu as specified in clause 6.2.7, the V2X application server shall receive one or more UDP message(s) as data of a point-to-point tunnel established over N6 and shall extract a V2X message and a V2X message family (if the V2X message is non-IP based) from the received UDP message.

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

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

The V2X application server shall be configured with UDP port(s), TCP port(s) or any combination of them for transport of the V2X communication over Uu to the UE.

If the V2X application server supports V2X messages of IP type of data and of non-IP type of data, then the V2X application server shall be configured with different UDP ports or TCP ports for V2X messages of different types of data.

If the V2X application server supports V2X messages of several V2X message families, then the V2X application server shall be configured with different UDP ports or TCP ports for V2X messages of different V2X message families.

If the V2X application server determines to use UDP for transmission of the V2X message identified by a V2X service identifier, the V2X application server shall generate a UDP message. If the V2X message is of "Unstructured" PDU Session type, then the V2X application server shall encapsulate the V2X message into IP type data. In the UDP message, the V2X application server:

a) shall set data octets field to the V2X message if the V2X message is of IP type;

a) shall set data octets field to the encapsulated IP type data if the V2X message is of "Unstructured" PDU Session type; and

c) shall set the destination IP address and the destination UDP port to the UE’s IP address and the configured UDP port associated the type of data of the V2X message and the V2X message family of the data of the V2X message (in case of non-IP).

The V2X application server sends the UDP message as the user plane data to the UE.

If the V2X application server determines to use TCP for transmission of the V2X message identified by a V2X service identifier, the V2X application server establishes a TCP connection with the UE if no TCP connection exists, then the V2X application server shall generate a TCP message. In the TCP message, the V2X application server:

a) shall set data octets field to the V2X message; and

b) shall set the destination IP address and the destination TCP port to the UE’s IP address and the configured TCP port associated the type of data of the V2X message and the V2X message family of the data of the V2X message (in case of non-IP).

The V2X application server sends the TCP message as the user plane data to the UE.

\* \* \* Next 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 9.2.1) 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:

1) the type of data in the V2X message is non-IP; or

2) the type of data in the V2X message is IP, and the V2X service identifier is not included in the list of V2X service identifiers of the V2X services configured for V2X communication over Uu using existing unicast routing as 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;

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

i) 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; and

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

A) 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

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

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

A) 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

B) 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

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9.2.1 Void\* \* \* End of Changes \* \* \* \*