# ETSI TS 122 186 V15.4.0 (2018-10)

**TECHNICAL SPECIFICATION**

**5G;**
**Service requirements for enhanced V2X scenarios**
**(3GPP TS 22.186 version 15.4.0 Release 15)**

*ETSI*

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# Contents

# Foreword

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x the first digit:

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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# 1 Scope

The present document specifies service requirements to enhance 3GPP support for V2X scenarios in the 3GPP systems (i.e. EPS, 5G).

It includes transport layer support for both safety and non-safety V2X scenarios:

- Safety-related V2X scenarios: e.g. automated driving, vehicle platooning

- Non-safety-related V2X scenarios: e.g., mobile high data rate entertainment, mobile hotspot/office/home, dynamic digital map update

# 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 22.261: "Service requirements for the 5G system".

[3]     3GPP TS 22.185: "Service requirements for V2X services".

[4]     SAE International, "AUTOMATED DRIVING LEVELS OF DRIVING AUTOMATION ARE DEFINED IN NEW SAE INTERNATIONAL STANDARD J3016", December 2016; US Homeland Security Digital Library, "Self-Driving Cars: Levels of Automation", March 2017 https://www.hsdl.org/?view&did=801463.

[5]     ISO TS 17419:2014: "Intelligent Transport Systems - Cooperative systems - Classification and management of ITS applications in a global context".

[6]     IEEE Std 1609.0-2013: "IEEE Guide for Wireless Access in Vehicular Environments (WAVE) architecture".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**End-to-end latency:** Time it takes to transfer a given piece of information from a source to a destination, measured at the application level, from the moment it is transmitted by the source to the moment it is received at the destination.

**Reliability (%):** The success probability of transmitting X bytes within a certain delay, which is the time it takes to deliver a small data packet from the radio protocol layer 2/3 SDU ingress point to the radio protocol layer 2/3 SDU egress point of the radio interface.

**Road Side Unit:** A stationary infrastructure entity supporting V2X applications that can exchange messages with other entities supporting V2X applications.

NOTE: RSU is a term frequently used in existing ITS specifications, and the reason for introducing the term in the 3GPP specifications is to make the documents easier to read for the ITS industry. RSU is a logical entity that supports V2X application logic using the functionality provided by either a 3GPP network or an UE (referred to as UE-type RSU).

For the purposes of the present document, the following terms and definitions given in ISO TS 17419 [5] apply:
ITS Application Identifier: globally unique, registered number identifying an ITS application object
For the purposes of the present document, the following term and definition given in IEEE Std 1609.0 [6] apply:
Provider Service Identifier: An identifier of an application-service provided by a higher layer entity.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

| | |
|---|---|
| ITS | Intelligent Transport Systems |
| ITS-AID | ITS Application Identifier |
| LoA | Level of Automation |
| PSID | Provider Service Identifier |
| RSU | Road Side Unit |

# 4 Overview

## 4.1 Categories of requirements to support eV2X scenarios

Different V2X scenarios require the transport of V2X messages with different performance requirements for the 3GPP system. This Technical Specification specifies service requirements to enhance 3GPP support for V2X scenarios in the following five areas:

- General Aspects: interworking, communication-related requirements valid for all V2X scenarios

- Vehicles Platooning

- Advanced Driving

- Extended Sensors

- Remote Driving

Vehicles Platooning enables the vehicles to dynamically form a group travelling together. All the vehicles in the platoon receive periodic data from the leading vehicle, in order to carry on platoon operations. This information allows the distance between vehicles to become extremely small, i.e., the gap distance translated to time can be very low (sub second). Platooning applications may allow the vehicles following to be autonomously driven.

Advanced Driving enables semi-automated or fully-automated driving. Longer inter-vehicle distance is assumed. Each vehicle and/or RSU shares data obtained from its local sensors with vehicles in proximity, thus allowing vehicles to coordinate their trajectories or maneuvers. In addition, each vehicle shares its driving intention with vehicles in proximity. The benefits of this use case group are safer traveling, collision avoidance, and improved traffic efficiency.

Extended Sensors enables the exchange of raw or processed data gathered through local sensors or live video data among vehicles, RSUs, devices of pedestrians and V2X application servers. The vehicles can enhance the perception of their environment beyond what their own sensors can detect and have a more holistic view of the local situation.

Remote Driving enables a remote driver or a V2X application to operate a remote vehicle for those passengers who cannot drive themselves or a remote vehicle located in dangerous environments. For a case where variation is limited and routes are predictable, such as public transportation, driving based on cloud computing can be used. In addition, access to cloud-based back-end service platform can be considered for this use case group.

## 4.2 Level of Automation

A relevant aspect of advanced V2X applications is the Level of Automation (LoA), which reflects the functional aspects of the technology and affects the system performance requirements. In accordance with the levels from SAE [4], the LoA are: 0 – No Automation, 1 – Driver Assistance, 2 – Partial Automation, 3 – Conditional Automation, 4 – High Automation, 5 – Full Automation.

A distinction is drawn between lower levels and higher levels based on whether the human operator or the automated system is primarily responsible for monitoring the driving environment.

The 3GPP system provides the performances expected for all levels of automation

# 5 Requirements

## 5.1 General Requirements

[R.5.1-001]   The 3GPP system shall be able to control the communication range for a message based on the characteristic of the messages transmitted by a UE supporting V2X application.

[R.5.1-002]   The 3GPP system shall be able to optimize the communication between UEs supporting V2X application belonging to the same group and in proximity.

[R.5.1-003]   The 3GPP system shall be able to support the message transfer for group management operations as requested by the application layer.

   NOTE 1:  The determination of group membership may be done at the upper layers and/or lower layers (application and/or Layer 2).

[R.5.1-004]   The 3GPP system shall be able to support message transfer among a group of UEs supporting V2X application.

[R.5.1-005]   The 3GPP system shall be able to support message transfer between two UEs belonging to the same group of UEs supporting V2X application.

[R.5.1-006]   The 3GPP system shall be able to support confidentiality and integrity of message transfer among a group of UEs supporting V2X application.

[R.5.1-007]   The 3GPP system shall support relative lateral position accuracy of 0.1 m between UEs supporting V2X application.

[R.5.1-008]   The 3GPP system shall support high connection density for congested traffic.

   NOTE 2:  Example estimate is for worst case US Freeway scenario that does not include arterial roads (i.e. onramps): 5 lanes in each direction or 10 lanes total per highway, for up to 3 highways intersecting = 3,100 to 4,300 cars per square kilometer

[R.5.1-009]   The 3GPP system shall support efficient coordination of radio resources used for transport of messages to maximize the utilization of the available spectrum and to ensure the required reliability.

[R.5.1-010]   The 3GPP system shall be able to control the UL and DL reliability of transport of V2X communications, depending on the requirement of V2X application

[R.5.1-011]   Impact to E-UTRA(N) by UE supporting only NR based V2X communication shall be minimized.

[R.5.1-012]   Impact to NR by UE supporting only E-UTRA based V2X communication shall be minimized.

[R.5.1-013]   The 3GPP system shall be able to support message transfer between UEs or between a UE and a UE-type RSU, regardless of whether or not they are subscribers of the same PLMN supporting V2X communications. In case they are subscribers to different PLMNs, there shall be no service degradation of the message transfer.

[R.5.1-014]   The 3GPP system shall enable discovery and communication between UEs supporting the same V2X application.

[R.5.1-015]    The 3GPP system shall be able to support the operators to select which 3GPP RAT to use for a V2X application.

NOTE 3:  Different V2X applications can be identified by use of different ITS-AID or PSID.

[R.5.1-016]    The 3GPP system shall enable a UE supporting a V2X application to obtain network access via another UE supporting V2X application.

[R.5.1-017]    The 3GPP system shall enable a UE supporting a V2X application to discover another UE supporting V2X application that can offer access to the network.

[R.5.1-018]    The 3GPP system shall support switching between direct 3GPP connection and indirect 3GPP connection via a UE supporting a V2X application, for a UE supporting a V2X application.

[R.5.1-019]    The 3GPP system should be able to support confidentiality and integrity of message transfer between a UE supporting a V2X application and network, when the UE is using an indirect 3GPP connection.

[R.5.1-020]    The 3GPP system shall allow UEs supporting V2X application to use NR for direct communication when the UEs are not served by a RAN using NR.

[R.5.1-021]    The 3GPP system shall allow UEs supporting V2X application to use E-UTRA for direct communication when the UEs are not served by a RAN using E-UTRA.

[R.5.1-022]    An RSU shall be able to communicate with up to 200 UEs supporting a V2X application.

NOTE 4:  This requirement specifies the number of UEs that RSU should be capable of handling. The requirement is not applied to the number of UE in a platoon.

NOTE 5:  This requirement is not applied to UE-type RSU.

[R.5.1-023]    The 3GPP system shall be able to support confidentiality and integrity of message transfer between a UE supporting V2X application and a V2X application server.

[R.5.1-024]    The 3GPP system shall provide a mechanism to provide addressing information (e.g. IP address or FQDN) of V2X application server(s) to the UEs supporting V2X applications.

## 5.2    Requirements to support Vehicles Platooning

[R.5.2-001] The 3GPP system shall be able to support up to 5 UEs for a group of UEs supporting V2X application.

[R.5.2-002] For Vehicle Platooning, the 3GPP system shall be able to support reliable V2V communications between a specific UE supporting V2X applications and up to 19 other UEs supporting V2X applications.

NOTE 1:  For group of heavy goods vehicle platooning, the number of UEs in a platoon can be smaller, due to communication range, the length of truck, inter-truck distance, etc.

[R.5.2-003] The 3GPP system shall support relative longitudinal position accuracy of less than 0.5 m for UEs supporting V2X application for platooning in proximity.

**Table 5.2-1 Performance requirements for Vehicles Platooning**

| Communication scenario description | | Req # | Payload (Bytes) | Tx rate (Message / Sec) | Max end-to-end latency (ms) | Reliability (%) (NOTE 5) | Data rate (Mbps) | Min required communication range (meters) (NOTE 6) |
|---|---|---|---|---|---|---|---|---|
| Scenario | Degree | | | | | | | |
| Cooperative driving for vehicle platooning Information exchange between a group of UEs supporting V2X application. | Lowest degree of automation | [R.5.2-004] | 300-400 (NOTE 2) | 30 | 25 | 90 | | |
| | Low degree of automation | [R.5.2-005] | 6500 (NOTE 3) | 50 | 20 | | | 350 |
| | Highest degree of automation | [R.5.2-006] | 50-1200 (NOTE 4) | 30 | 10 | 99.99 | | 80 |
| | High degree of automation | [R.5.2-007] | | | 20 | | 65 (NOTE 3) | 180 |
| Reporting needed for platooning between UEs supporting V2X application and between a UE supporting V2X application and RSU. | N/A | [R.5.2-008] | 50-1200 | 2 | 500 | | | |
| Information sharing for platooning between UE supporting V2X application and RSU. | Lower degree of automation | [R.5.2-009] | 6000 (NOTE 3) | 50 | 20 | | | 350 |
| | Higher degree of automation | [R.5.2-0010] | | | 20 | | 50 (NOTE 3) | 180 |
| NOTE 2: This value is applicable for both triggered and periodic transmission of data packets. | | | | | | | | |
| NOTE 3: The data that is considered in this V2X scenario includes both cooperative manoeuvres and cooperative perception data that could be exchanged using two separate messages within the same period of time (e.g., required latency 20ms). | | | | | | | | |
| NOTE 4: This value does not including security related messages component. | | | | | | | | |
| NOTE 5: Sufficient reliability should be provided even for cells having no value in this table | | | | | | | | |
| NOTE 6: This is obtained considering UE speed of 130km/h. All vehicles in a platoon are driving in the same direction. | | | | | | | | |

## 5.3 Requirements to support Advanced Driving

**Table 5.3-1 Performance requirements for advanced driving**

| Communication scenario description | | Req # | Payload (Bytes) | Tx rate (Message /Sec) | Max end-to-end latency (ms) | Reliability (%) (NOTE3) | Data rate (Mbps) | Min required Communication range (meters) (NOTE 4) |
|---|---|---|---|---|---|---|---|---|
| Scenario | Degree | | | | | | | |
| Cooperative collision avoidance between UEs supporting V2X applications. | | [R.5.3-001] | 2000 (NOTE 5) | 100 (NOTE 5) | 10 | 99.99 | 10 (NOTE 1) | |
| Information sharing for automated driving between UEs supporting V2X application. | Lower degree of automation | [R.5.3-002] | 6500 (NOTE 1) | 10 | 100 | | | 700 |
| | Higher degree of automation | [R.5.3-003] | | | 100 | | 53 (NOTE 1) | 360 |
| Information sharing for automated driving between UE supporting V2X application and RSU | Lower degree of automation | [R.5.3-004] | 6000 (NOTE 1) | 10 | 100 | | | 700 |
| | Higher degree of automation | [R.5.3-005] | | | 100 | | 50 (NOTE 1) | 360 |
| Emergency trajectory alignment between UEs supporting V2X application. | | [R.5.3-006] | 2000 (NOTE 5) | | 3 | 99.999 | 30 | 500 |
| Intersection safety information between an RSU and UEs supporting V2X application. | | [R.5.3-007] | UL: 450 | UL: 50 | | | UL: 0. 25 DL: 50 (NOTE 2) | |
| Cooperative lane change between UEs supporting V2X applications. | Lower degree of automation | [R.5.3-008] | 300-400 | | 25 | 90 | | |
| | Higher degree of automation | [R.5.3-009] | 12000 | | 10 | 99.99 | | |
| Video sharing between a UE supporting V2X application and a V2X application server. | | [R.5.3-010] | | | | | UL: 10 | |
| NOTE 1: This includes both cooperative manoeuvers and cooperative perception data that could be exchanged using two separate messages within the same period of time (e.g., required latency 100ms). | | | | | | | | |
| NOTE 2: This value is referring to a maximum number of 200 UEs. The value of 50 Mbps DL is applicable to broadcast or is the maximum aggregated bitrate of the all UEs for unicast. | | | | | | | | |
| NOTE 3: Sufficient reliability should be provided even for cells having no values in this table | | | | | | | | |
| NOTE 4: This is obtained considering UE speed of 130km/h. Vehicles may move in different directions. | | | | | | | | |
| NOTE 5: These values are based on calculations for cooperative maneuvers only. | | | | | | | | |

## 5.4 Requirements to support Extended Sensors

**Table 5.4-1 Performance requirements for extended sensors**

| Communication scenario description | | Req # | Payload (Bytes) | Tx rate (Message /Sec) | Max end-to-end latency (ms) | Reliability (%) | Data rate (Mbps) | Min required communication range (meters) |
|---|---|---|---|---|---|---|---|---|
| Scenario | Degree | | | | | | | |
| Sensor information sharing between UEs supporting V2X application | Lower degree of automation | [R.5.4-001] | 1600 | 10 | 100 | 99 | | 1000 |
| | Higher degree of automation | [R.5.4-002] | | | 10 | 95 | 25 (NOTE 1) | |
| | | [R.5.4-003] | | | 3 | 99.999 | 50 | 200 |
| | | [R.5.4-004] | | | 10 | 99.99 | 25 | 500 |
| | | [R.5.4-005] | | | 50 | 99 | 10 | 1000 |
| | | [R.5.4-006] (NOTE 2) | | | 10 | 99.99 | 1000 | 50 |
| Video sharing between UEs supporting V2X application | Lower degree of automation | [R.5.4-007] | | | 50 | 90 | 10 | 100 |
| | Higher degree of automation | [R.5.4-008] | | | 10 | 99.99 | 700 | 200 |
| | | [R.5.4-009] | | | 10 | 99.99 | 90 | 400 |
| NOTE 1: This is peak data rate.<br>NOTE 2: This is for imminent collision scenario. | | | | | | | | |

## 5.5 Requirements to support Remote Driving

[R.5.5-001]    The 3GPP system shall support message exchange between a UE supporting V2X application and V2X application server for an absolute speed of up to 250 km/h.

**Table 5.5-1 Performance requirements for remote driving**

| Communication scenario description | Req # | Max end-to-end latency (ms) | Reliability (%) | Data rate (Mbps) |
|---|---|---|---|---|
| Information exchange between a UE supporting V2X application and a V2X Application Server | [R.5.5-002] | 5 | 99.999 | UL: 25 DL: 1 |

# Annex A (informative):
# Background information on service Requirements

For each requirement in this specification, Table A-1 indicates reference to the consolidated potential requirements in TR 22.886:

**Table A-1 Reference information for requirements**

| Requirement # in this specification | CPR # in TR 22.886 |
|---|---|
| [R.5.1-001] | [CPR.G-001] |
| [R.5.1-002] | [CPR.G-002] |
| [R.5.1-003] | [CPR.G-003] |
| [R.5.1-004] | [CPR.G-004] |
| [R.5.1-005] | [CPR.G-005] |
| [R.5.1-006] | [CPR.G-006] |
| [R.5.1-007] | [CPR.G-007] |
| [R.5.1-008] | [CPR.G-009] |
| [R.5.1-009] | [CPR.G-010] |
| [R.5.1-010] | [CPR.G-011] |
| [R.5.1-011] | [CPR.G-012] |
| [R.5.1-012] | [CPR.G-013] |
| [R.5.1-013] | [CPR.G-014] |
| [R.5.1-014] | [CPR.G-016] |
| [R.5.1-015] | [CPR.G-017] |
| [R.5.1-016] | [CPR.G-018] |
| [R.5.1-017] | [CPR.G-019] |
| [R.5.1-018] | [CPR.G-020] |
| [R.5.1-019] | [CPR.G-021] |
| [R.5.1-020] | [CPR.G-022] |
| [R.5.1-021] | [CPR.G-022] |
| [R.5.1-022] | [CPR.G-023] |
| [R.5.1-023] | [CPR.G-025] |
| [R.5.2-001] | [CPR.P-001] |
| [R.5.2-002] | [CPR.P-002] |
| [R.5.2-003] | [CPR.P-003] |
| [R.5.2-004] | [CPR.P-005] |
| [R.5.2-004] | [CPR.P-007] |
| [R.5.2-005] | [CPR.P-009] |
| [R.5.2-006] | [CPR.P-008] |
| [R.5.2-006] | [CPR.P-004] |
| [R.5.2-007] | [CPR.P-010] |
| [R.5.2-008] | [CPR.P-006] |
| [R.5.2-009] | [CPR.P-011] |
| [R.5.2-010] | [CPR.P-012] |
| [R.5.3-001] | [CPR.A-001] |
| [R.5.3-002] | [CPR.A-002] |
| [R.5.3-003] | [CPR.A-003] |
| [R.5.3-004] | [CPR.A-004] |
| [R.5.3-005] | [CPR.A-005] |
| [R.5.3-006] | [CPR.A-006] |
| [R.5.3-007] | [CPR.A-007] |
| [R.5.3-008] | [CPR.A-008] |
| [R.5.3-009] | [CPR.A-009] |
| [R.5.3-010] | [CPR.A-010] |
| [R.5.4-001] | [CPR.E-002] |
| [R.5.4-002] | [CPR.E-001] |
| [R.5.4-003] | [CPR.E-003] |
| [R.5.4-004] | [CPR.E-004] |

| [R.5.4-005] | [CPR.E-005] |
|---|---|
| [R.5.4-006] | [CPR.E-006] |
| [R.5.4-007] | [CPR.E-007] |
| [R.5.4-008] | [CPR.E-008] |
| [R.5.4-009] | [CPR.E-008] |
| [R.5.5-001] | [CPR.R-001] |
| [R.5.5-002] | [CPR.R-001]<br>[CPR.R-002]<br>[CPR.R-003]<br>[CPR.R-004] |

# Annex B (informative):
# Relation between TS 22.185 and this TS

3GPP Technical Specification on Service Requirements for V2X Services [3] was developed with focus on basic safety aspect and non-safety aspect using LTE-based technology. This Technical Specification on Enhancement of 3GPP Support for V2X Services was developed with focus on enhancements of V2X Use Case scenarios, including more rigorous functional requirements for advanced features that cannot be achieved by [3].

# Annex C (informative): Relationship between V2X applications and V2X requirements

In this specification, performance requirements for various scenarios are defined. KPIs of the various scenarios are not mutually exclusive. When several V2X applications are simultaneously running in the vehicle, total performance requirement to serve that vehicle is not the sum of individual performance requirement of each V2X application:

- Different use cases or applications may use and share same V2X message. For example, according to ETSI TS 102.637, information included in a DENM message can be used by multiple applications such as emergency electronic brake lights, wrong way driving warning and so on. Thus, there is no need for each application to generate separately V2X messages.

- According to ETSI EN 302.665, V2X application layer is separated from V2X Facilities layer. V2X applications do not have V2X message handling capabilities, and this is left to V2X Facilities layer. Because V2X Facilities layer serves all V2X applications, the V2X Facilities layer can optimize V2X message handling, by considering overall requirements of different V2X applications.

Figure C-1 shows one of example configuration where multiples V2X applications and one common V2X message handling entity exist. Because only one driving wheel, one accelerator and one brake exist in a vehicle, the applications in a vehicle may either be combined or operate in a harmonized fashion. Then, V2X messages are also used in a harmonized fashion.
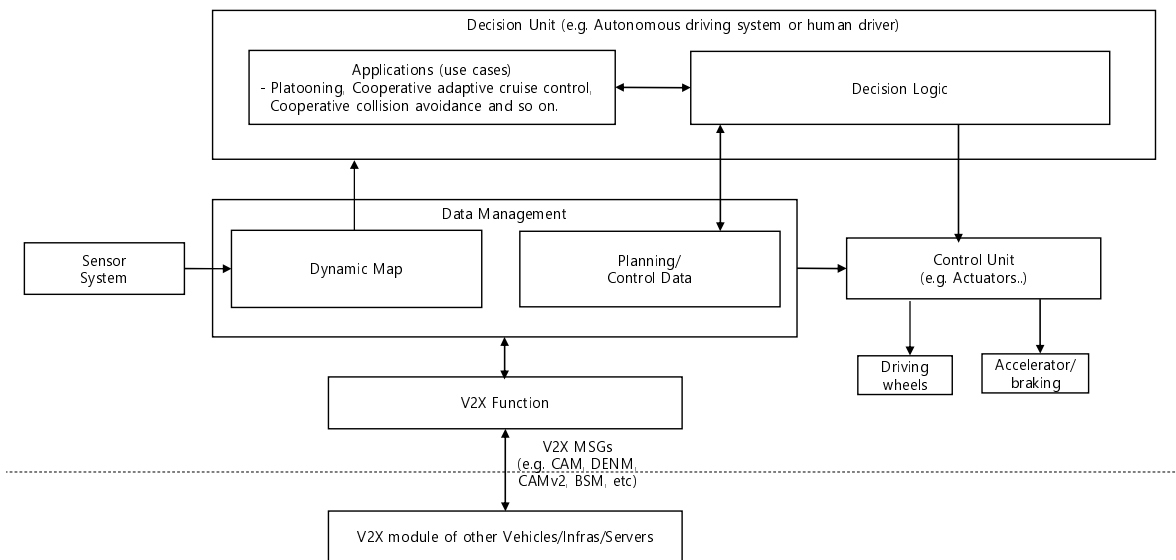


**Figure C-1. Relationship between V2X messages and Applications (illustrative purpose only)**

# Annex D (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017-01 | | | | | | Skeleton | 0.1.0 |
| 2017-02 | | | | | | Update based on agreement in SA1 #77 | 0.2.0 |
| 2017-03 | SA#75 | SP-170158 | | | | MCC Clean-up | 1.0.0 |
| 2017-03 | SA#75 | SP-170250 | | | | Update based on input from SA#75, including assigned TS number | 1.0.1 |
| 2017-03 | | | | | | Raised to v.15.0.0 following SA's approval | 15.0.0 |

| Change history | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **TSG SA#** | **SA Doc.** | **SA1 Doc** | **Spec** | **CR** | **Rev** | **Rel** | **Cat** | **Subject/Comment** | **Old** | **New** | **Work Item** |
| SP-76 | SP-170444 | S1-172363 | 22.186 | 0006 | 4 | Rel-15 | B | Adding requirement on addressing information of V2X application server(s) | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172304 | 22.186 | 0003 | 1 | Rel-15 | F | Clean-up of KPI of eV2X TS | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172311 | 22.186 | 0008 | 3 | Rel-15 | F | Consolidate communication range in 5.3 Advanced Driving | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172310 | 22.186 | 0009 | 2 | Rel-15 | F | Correction of NOTE 2 UL/DL values in 5.3 Advanced Driving | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172301 | 22.186 | 0007 | 1 | Rel-15 | D | Editorial modifications for TS 22.186 | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172306 | 22.186 | 0012 | 1 | Rel-15 | D | Global editorial clean-up | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172309 | 22.186 | 0001 | 2 | Rel-15 | F | Removal of editor's NOTE in section 5.1 | 15.0.0 | 15.1.0 | eV2X |
| SP-76 | SP-170444 | S1-172313 | 22.186 | 0010 | 2 | Rel-15 | C | Remove the brakets and Editor's note in Video sharing of 5.4 Extended Sensors | 15.0.0 | 15.1.0 | eV2X |
| SP-77 | SP-170693 | S1-173479 | 22.186 | 0013 | 2 | Rel-15 | F | Correction to information exchange via RSU | 15.1.0 | 15.2.0 | eV2X |
| SP-77 | SP-170693 | S1-173480 | 22.186 | 0015 | 2 | Rel-15 | F | correction to data rate and transmission rate | 15.1.0 | 15.2.0 | eV2X |
| SP-80 | SP-180309 | S1-181562 | 22.186 | 0016 | 2 | Rel-15 | F | Update the note in the RSU definition | 15.2.0 | 15.3.0 | eV2X |
| SP-81 | SP-180755 | S1-182625 | 22.186 | 001 | 1 | Rel-15 | D | SAE International's Levels of Automation reference link | 15.3.0 | 15.4.0 | eV2X |

# History

| Document history | | |
|---|---|---|
| V15.3.0 | July 2018 | Publication |
| V15.4.0 | October 2018 | Publication |
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