

5GAA TR S-180179

Technical Report

**5G Automotive Association;
Working Group on Standards and Spectrum (WG4);**

**Initial C-V2X System Profile (ICSP)
– Amendments to C2C-CC Basic System Profile**

5GAA

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Important note

The objective of the document is to provide changes that can be applied to the C2C-CC Basic System Profile in order to make it applicable to C-V2X for the ‘Day 1’ use cases envisioned by the European Commission. To make full use of this document, the C2C-CC documents must be acquired separately and with permission from the C2C-CC consortium. To the extent that portions of the C2C-CC documents are not suggested to be modified, replaced or deleted in creating implementations of the C-V2X implementations by this document, such documents may be otherwise considered normative references.

Because the C2C-CC documentation is protected by copyrights, this document contains only incremental changes that may be applied to the C2C-CC BSP, referring to the corresponding items that are to be replaced or not applicable for C-V2X. The changes are based on release 1.3.0 of [C2C-CC BSP] and [C2C-CC Feat]. Updates or new versions of the C2C-CC documents should be reviewed and may lead to further suggested differences from the C2C-CC documents, and this document is not provided with any expectation that the suggestions in this document would meet the requirements of the C2C-CC.

It is assumed that the C2C-CC documents [C2C-CC Trig] describing C-ITS service and triggering conditions are already in a technology neutral state and can be reused for C-V2X as is.

Foreword

This Technical Report has been produced by 5GAA.

The contents of the present document are subject to continuing work within the Working Groups (WG) and may change following formal WG approval. Should the WG modify the contents of the present document, it will be re-released by the WG with an identifying change of the consistent numbering that all WG meeting documents and files should follow (according to 5GAA Rules of Procedure):

x-nnzzzz

(1) This numbering system has six logical elements:

(a) x: A single letter corresponding to the working group:

where x =

T (Use cases and Technical Requirements)

B (Business Models and Go-To-Market Strategies)

A (System Architecture and Solution Development)

S (Standards and Spectrum)

P (Evaluation, Testbed and Pilots)

E (Security and Privacy)

(b) nn: Two digits to indicate the year. i.e. 16,17,18, etc

(c) zzzz: Unique number of the document

(2) No provision is made for the use of revision numbers. Documents which are a revision of a previous version should indicate the document number of that previous version.

(3) The file name of documents shall be the document number. For example, document S-160357 will be contained in file S-160357.doc.

1 Introduction

<AM_BSP_001>

Several initiatives had been started to introduce C-V2X technology for different use cases into different international standards and industry organisations, which were traditionally focusing only on DSRC/ITS-G5. At the same time, some regulatory bodies are considering to mandate C-ITS technologies to foster its deployments. For example, the Commission proposed a Delegated Act which was supposed to regulate the C-ITS deployment in Europe based on currently existing technologies. On 8th July 2019 the Council of the European Union adopted a decision to object against the proposal for Delegated Regulation on Cooperative Intelligent Transport Systems.

While C-V2X standards are already finalised for 3GPP Rel. 14 and 5GAA published [White Paper on C-V2X Use Cases: Methodology, Examples and Service Level Requirements](#), there are still many options on how to configure and establish parameters for C-V2X systems. In order to provide a common standard interpretation, corresponding system profiles are needed, which outline the basic system settings and environments.

In Europe, Basic System Profiles (BSPs) have been developed by the Car-2-Car Communication Consortium (C2C-CC) and the EU-funded C-ROADS Platform project, assuming ITS-G5 with IEEE 802.11p as radio access technology for V2V and V2I communication. Though many aspects of the existing BSPs could be reused, there are some modifications needed for C-V2X. In addition, there would be extensions required in order to accommodate alternative communication links like V2P, V2N, and V2C.

The text of the rejected EU Delegated Act proposal included input from the proprietary C2C-CC and C-ROADS BSPs. Since this would limit the C-ITS deployment to ITS-G5 technologies, amendments considering the basic system profile for C-V2X would be needed in order to achieve technology neutrality.

2 Scope

<AM_BSP_002>

The scope of this document is the extent to which the C2C-CC basic system profile [C2C-CC BSP] should be amended, focusing on the direct communication interface PC5 used in Mode 4 of the C-V2X system specified in [ETSI TS 136 300].

This document shall enable the use of the PC5 interface of C-V2X systems for ‘Day 1’ applications envisioned by the Commission which are expected to be used in initial deployments for C-ITS systems, acknowledging and reusing most of the prior work of C2C-CC in order to achieve the highest degree of interoperability on the application level.

3 Conventions to be used

3.1 Model verbs terminology

<AM_BSP_003> (replaces RS_BSP_152)

In the present document **shall**, **shall not**, **should**, **should not**, **may**, **need not**, **will**, **will not**, **can** and **cannot** are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

Words such as **must** and **must not** are NOT allowed in ETSI deliverables except when used in direct citation.

3.2 Item identification

<AM_BSP_004> (replaces RS_BSP_421)

This document contains individual requirement items which are assigned with unambiguous references starting with ‘AM_BSP_’ as prefix. The unique identifier should be used as a reference for any comments/questions instead of sections or page numbers, which can be affected by formatting and other subsequent changes.

References to corresponding items of [C2C-CC BSP] are denoted with the prefix ‘RS_BSP_’ or the corresponding section number as needed. If an item shall be replaced, the unique identifier will be appended by a bracket term indicating the identifier it replaces, e.g. (replaces RS_BSP_123).

3.3 Provisions from referenced documents

<AM_BSP_005> (replaces RS_BSP_153)

Normative requirements of referred standard documents which support the functionality of the C-V2X Basic System shall be applied, unless explicitly specified otherwise in this document.

Requirements specified in this document shall clarify and take precedence over requirements of referred documents in case they are ambiguous or in contradiction with the specifications in this document. This excludes obvious errors or misinterpretations, which would require a revision of this document.

4 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.

The following amends normative and informative references given in [C2C-CC Ref].

Note that references given in RS_Refs_00427 of [C2C-CC Ref] can be adopted without version numbers in order to account for technical evolutions.

4.1 Normative references

<AM_BSP_006> (appends RS_BSP_427)

[ETSI TS 103 613]	Intelligent Transport Systems (ITS); Access Layer Specification for Intelligent Transport Systems Using LTE Vehicle-to-Everything Communication in the 5.9 GHz Frequency Band
[ETSI TS 102 636-7-1]	ETSI TS 102 636-7-1: Intelligent Transport Systems (ITS); GeoNetworking; Part 7: Amendments for C-V2X; Sub-part 1: Amendments to EN 303 636-4-1 (Media-Independent Functionality)
[ETSI TS 102 636-7-2]	ETSI TS 102 636-7-2: Intelligent Transport Systems (ITS); GeoNetworking; Part 7: Amendments for C-V2X; Sub-part 1: Amendments to EN 303 636-5-1 (Basic Transport Protocol)
[ETSI TS 103 574]	ETSI TS 103 574: Intelligent Transport System (ITS); Congestion Control Mechanisms for C-V2X PC5 Interface; Access Layer Part

[ETSI TS 136 300]	ETSI TS 136 300; LTE, Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN), Overall Description (3GPP TS 36.300 Release 14)
[ETSI TS 136 101]	ETSI TS 136 101: LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Radio Transmission and Reception (3GPP TS 36.101 Release 14)
[5GAA TR P-180065]	5GAA: General Aspects and Strategy to Assess System Performance, Interoperability, and Conformance, doc # TR P-180065-RevA

4.2 Informative references

<AM_BSP_007> (replaces RS_BSP_151)

[C2C-CC BSP]	C2C-CC Basic System Profile, Release 1.3.0
[C2C-CC Feat]	C2C-CC Features, Release 1.3.0
[C2C-CC Trig]	C2C-CC Triggering Conditions and Data Quality on Adverse Weather, Dangerous Situation, Exchange Of IRCs, Special Vehicle, Stationary Vehicle, and Traffic Jam, Release 1.3.0
[C2C-CC HSM]	C2C-CC Protection Profile V2X Hardware Security Module, Release 1.3.0
[C2C-CC Ref]	C2C-CC References, Release 1.3.0
[5GAA Uu CSP]	5G Automotive Association; Task Force: Profiles for Cellular Uu-based C-ITS; C-ITS Communication System Profile Using Cellular Uu Interface, Sep. 2018

5 Definitions and abbreviations

5.1 Definitions

For the purpose of the present document, definitions are adopted from [C2C-CC BSP] and amended by the following items.

<AM_BSP_008>(replaces RS_BSP_149)

A C-V2X Basic System is a C-ITS vehicle sub-system as outlined in [C2C-CC Feat] employing C-V2X technologies according to [ETSI TS 136 300], where the PC5 link is used for direct communication instead of ITS-G5, and the Uu interface is used for V2X communication via cellular network infrastructure. For simplicity reason, C-V2X Basic System in the present document stands for *C-V2X Basic System using the PC5 interface*, while the system profile of C-V2X Basic System using the Uu interface is out of the scope of this document and defined in [5GAA Uu CSP].

C-ITS Basic System is a technology neutral term which can encompass either an ITS-G5 system based on IEEE 802.11p technology or a C-V2X system based on 3GPP Rel. 14 or newer releases.

<AM_BSP_009>

For the purpose of adapting the requirements from [C2C-CC BSP], [C2C-CC Feat], [C2C-CC Trig], and [C2C-CC HSM] to a C-V2X Basic System, we replace all references to the terms ‘C2C-CC Basic System’ to a generic term ‘C-ITS Basic System’.

Furthermore, in order to keep technology neutrality, it is necessary to replace all occurrences of the term ‘ITS-G5’ by the term ‘C-ITS’. For the same reason, the term ‘DCC’ is replaced by the generic term ‘congestion control’.

<AM_BSP_010>

If not otherwise stated in this document, the requirements from [C2C-CC BSP], [C2C-CC Feat], [C2C-CC Trig], and [C2C-CC HSM] can be adapted for C-V2X systems as well.

3.2 Abbreviations

For the purpose of the present document, abbreviations and acronyms are adopted from [C2C-CC BSP] and amended by the following items.

<AM_BSP_011>(amends RS_BSP_150)

The following abbreviations should be added to those mentioned in [C2C-CC BSP]:

3GPP	3 rd Generation Partnership Project
5GAA	5G Automotive Association
C-V2X	Cellular Vehicle-to-Everything
C-ROADS	EU funded platform for C-ITS deployments
CBR	Channel Busy Ratio
CSP	C-V2X System Profile
ICSP	Initial C-V2X System Profile
PC5	3GPP direct communication interface (sidelink)
PPPP	ProSe Per Packet Priority
V2C	Vehicle-to-Cloud Communication
V2N	Vehicle-to-Network Communication
V2P	Vehicle-to-Pedestrian Communication
V2X	Vehicle-to-Everything Communication

6 Requirement specification

6.1 Applicable Items

The following requirements shall be applied for a C-V2X Basic System and amend [C2C-CC BSP].

<AM_BSP_012>(replaces RS_BSP_434)

The C-V2X Basic System's access layer shall conform to [ETSI TS 103 613].

<AM_BSP_013>(replaces RS_BSP_435)

The C-V2X Basic System shall be compliant with all relevant regulatory requirements.

<AM_BSP_014>(replaces RS_BSP_235)

For 'Day 1' applications, the C-V2X Basic System shall support the mapping of CAMs and DENMs to PPPP levels as defined in Table 1 below. Other PPPP levels such as 1,3,6,8 are reserved for future use.

TC	PPPP	Intended Use
----	------	--------------

0	2	high priority DENMs
1	4	normal DENMs
2	5	CAMs
3	7	forwarded DENMs and other low-priority messages

Table 1: Mapping between Traffic Class (TC) and PPPP

<AM_BSP_015>(replaces RS_BSP_436)

The congestion control mechanism of a C-V2X Basic System shall be compliant with [ETSI TS 103 574].

<AM_BSP_016>(replaces RS_BSP_238)

The C-V2X Basic System shall implement the congestion control mechanism in the access stratum using the parameters as defined in Table 1 of [ETSI TS 103 574].

<AM_BSP_017>(replaces RS_BSP_240)

C-V2X Basic System shall perform CBR measurements as defined in Clause 5.1.30 of [ETSI TS 136 214].

<AM_BSP_018>(replaces RS_BSP_241)

Hardware and software resources shall be handled by the C-V2X Basic System according to the performance requirements of the use cases. ‘Best effort’ principles may be applied within the system loading range to ensure functionality.

<AM_BSP_019>(replaces RS_BSP_242)

CAM message transmissions shall be handled by the C-V2X Basic System so that no outdated messages are conveyed even when ‘congestion control’ conditions apply.

<AM_BSP_020>(replaces RS_BSP_246)

When the C-V2X Basic System enters a protected communication zone, the C-V2X Basic System shall set its power $P_{\text{regulatory,c}}$ according to [ETSI TS 136 101] and apply the mitigation techniques as described in RS_BSP_458 or RS_BSP_459 without changing any other congestion control parameters. This requirement shall not be applied to messages with TC=0.

<AM_BSP_021>(replaces RS_BSP_437)

As far as the C-V2X Basic System is media-independent of GeoNetworking, it shall conform to [ETSI TS 302 636-7-1].

<AM_BSP_022>(replaces RS_BSP_267)

When forwarding packets, the C-V2X Basic System shall use the PPPP level, as profiled in AM_BSP_014.

<AM_BSP_023>(replaces RS_BSP_270)

All GeoNetworking frames sent by the C-V2X Basic System shall use the packet header fields, as given in [ETSI TS 102 636-7-1].

<AM_BSP_024>(replaces RS_BSP_438)

The Basic Transport Protocol of the C-V2X Basic System shall conform to [ETSI TS 302 636-7-2].

<AM_BSP_025>(amends RS_BSP_202, and RS_BSP_209)

A C-V2X Basic System device shall be tested to fulfill all regulatory requirements. The conformance assessment should follow the 5GAA guidelines given by [5GAA TR P-180065].

<AM_BSP_026>(amends RS_BSP_250)

Further relevant parameter settings for C-V2X Basic System shall be used, as defined in [ETSI TS 102 636-7-1].

<AM_BSP_027>(replaces RS_BSP_225)

A C-V2X Basic System shall use a sub-band dedicated to C-ITS, according to [ETSI EN 302 571], for all messages.

<AM_BSP_028>(replaces RS_BSP_245)

Transmission power control shall be applied as specified in [ETSI TS 103 574].

<AM_BSP_029>(amends RS_BSP_443)

For C-V2X Basic System, parameters of RS_BSP_443 can be adopted, unless otherwise specified in this item.

Parameter pGnInterfaceType shall be set to 'LTE-V2X', and further parameters shall be set according to AM_BSP_026.

For the C-V2X Basic System, congestion control parameters shall be set according to AM_BSP_014.

The following parameters are not applicable to the C-V2X Basic System:

pAlDataRateCch, pAlDataRateCchHigh, pAlDataRateCchLow, pDccCcaThresh, pDccMeasuringInterval, pDccMinSensitivity, pDccProbingDuration, pDccPToll, pDCCSensitivityMargin

6.2 Non-applicable items

The following items from [C2C-CC BSP] are not applicable to the C-V2X Basic System or are covered by other items, as appropriate.

RS_BSP_228, RS_BSP_397, RS_BSP_244, RS_BSP_263, RS_BSP_293

Annex A: Change history

Date	TDoc#	Subject/Comment
2018-09-07	S-180179	Final version RevA based on pA14
2018-09-27	S-180179-RevB	Corrigendum RevB