Features
CAR 2 CAR Communication Consortium

About the C2C-CC

Enhancing road safety and traffic efficiency by means of Cooperative Intelligent Transport Systems and Services (C-ITS) is the dedicated goal of the CAR 2 CAR Communication Consortium. The industrial driven, non-commercial association was founded in 2002 by vehicle manufacturers affiliated with the idea of cooperative road traffic based on Vehicle-to-Vehicle Communications (V2V) and supported by Vehicle-to-Infrastructure Communications (V2I). Today, the Consortium comprises 73 members, with 12 vehicle manufacturers, 33 equipment suppliers and 28 research organisations.

Over the years, the CAR 2 CAR Communication Consortium has evolved to be one of the key players in preparing the initial deployment of C-ITS in Europe and the subsequent innovation phases. CAR 2 CAR members focus on wireless V2V communication applications based on ITS-G5 and concentrate all efforts on creating standards to ensure the interoperability of cooperative systems, spanning all vehicle classes across borders and brands as well as other road users. As a key contributor, the CAR 2 CAR Communication Consortium works in close cooperation with the European and international standardisation organisations such as ETSI and CEN.

Disclaimer

Document information

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Table 1: Document information

Changes since last version

Title:	Features		
Explanatory notes:			
13/09/2019	Minor corrections	Release Management	Steering Committee
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Date	**Changes**	**Edited by**	**Approved**

Table 2: Changes since last version

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1 Introduction

Other (informational) **RS_FEA_147**

Within the open system architecture of Cooperative Intelligent Transport System (C-ITS) four types of participants, called sub-systems, are identified in [EN 302 665]: vehicle, roadside, personal, and central. Each of this sub-systems includes an ITS-S, but based on their sub-system specific equipment they enable different features. As a result of their feature list and their role in traffic, for each sub-system a set of use cases becomes possible to improve road safety and traffic efficiency.

2 Scope

Other (informational) **RS_FEA_146**

The present document provides all features in scope of a vehicle sub-system from C2C-CC point of view. This set of features is the consolidated and communicated understanding of the core vehicle system features in a C2C-CC Basic System. According to the C2C-CC contract, the present list focuses on specifying the C2C-CC Basic System on the vehicle ITS station transmitting side. Moreover, this set is oriented towards enabling the vehicle use cases as included in the current C2C-CC release. Details about the content of the release can be found in [C2CCC RelOv] and are listed in brief in the following:

- emergency vehicle warning
- dangerous situation
- stationary vehicle warning
- traffic jam ahead warning
- collision risk (exchange of IRCs)
- adverse weather conditions

The use cases as part of the current C2C-CC release do not constitute a mandatory set of applications to be implemented as part of a C2C-CC basic system. Only a subset of them might be supported by a specific implementation of the C2C-CC Basic System.

In terms of C2C-CC a feature defines a service or a major part of the C2C-CC Basic System. They always detail an objective, but – like objectives – without any further specification about its details. As a result features are not directly testable.

Features itself are detailed by one or more requirements. A feature can be assumed as tested, if all requirements, which detail this feature, are tested.

3   Conventions to be used

3.1   Modal verbs terminology

Other (informational)   **RS_FEA_152**

In this document the following verbal forms are used:

- **must:** indicates an absolute requirement of the specification due to legal issues
- **must not:** indicates an absolute prohibition of the specification due to legal issues
- **shall:** indicates an absolute requirement of the specification
- **shall not:** indicates an absolute prohibition of the specification
- **should:** indicates a recommendation. It means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- **should not:** indicates that something is not recommended. It means that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
- **may:** indicates that something is permitted/possible
- **can:** indicates that something is possible/capable
- **cannot:** indicates that something is not possible/capable
- **will / will not:** indicates the inevitable behavior of the described system
- **is / is not:** indicates facts

3.2   Item identification

Other (informational)   **RS_FEA_424**

Each item of this document has its unique identifier starting with "RS_FEA_" as prefix. For any review annotations, remarks and/or questions please refer to this unique ID rather than chapter or page numbers!

3.3   Provisions from referenced documents

Other (informational)   **RS_FEA_153**

Unless otherwise specified in the present document, the normative requirements included in the referenced documents supporting the required functionality of the C2C-CC Basic System shall apply. The verbal forms for the definition of provisions of referenced documents are defined either inside the document, or generally by the SDO (standardization organization) or the organization providing them. For example normative requirements in ETSI documents are indicated by the verbal form "shall".

In case of more than one option in the standard, this document specifies which one is the recommended choice to ensure interoperability and/or sufficient performance. This document supplements the standards in case where standards are open for interpretation or believed not to contain all necessary requirements to ensure interoperability and/or sufficient performance. This document might also supplement standards in cases where, for performance reasons, it is believe that more stringent requirements than the minimum requirements in the standard shall be applied to ensure sufficient performance.

3.4 Requirements quality

Other (informational)   **RS_FEA_423**

All Requirements shall have the following properties:

- **redundancy:** Requirements shall not be repeated within one requirement or in other requirements
- **clearness:** All requirements shall allow one possibility of interpretation only. Only technical terms of the glossary may be used. Furthermore, it must be clear from the requirement, what object the statement is a requirement on. Examples:
  - The <...> module shall/should/may ...
  - The <...> module's environment shall ...
  - The <...> configuration shall...
  - The function <...> shall ...
  - The hardware shall ...
- **atomicity:** Each Requirement shall only contain one requirement. A Requirement is atomic if it cannot be split up in further requirements.
- **testability:** Requirements shall be testable by analysis, review or test.
- **traceability:** The source and status of a requirement shall be visible at all times.
- **formulation:** All requirements shall be formulated so that they can be interpreted without the surrounding context (for example: "the function Xyz..." instead of "this function...").

4   Definitions and abbreviations

4.1   Definitions

Definition   **RS_FEA_149**

A *C2C-CC Basic System* is a C-ITS vehicle sub-system as outlined in this document.

Definition   **RS_FEA_427**

Vehicle states comprise absolute position, heading and velocity at a certain point in time.

Definition   **RS_FEA_428**

Information provided with a confidence level of 95 % means that the true value (e.g. position of a reference measurement system) is inside the range specified by the estimated value plus/minus the confidence interval (given by the confidence value) in 95 % of the data points in a given statistic base.

4.2   Abbreviations

Other (informational)   **RS_FEA_150**

BSP	Basic System Profile
C2C-CC	Car2Car communications Consortium
C-ITS	Cooperative Intelligent Transport System
DSRC	Dedicated Short Range Communication
ITS	Intelligent Transport System
ITS-S	ITS Station
PKI	Public Key Infrastructure

Table 3: Abbreviations

5 Feature specification

Feature	**RS_FEA_176**

The C2C-CC Basic System shall change authorization tickets.

Details:

Detailed by:

Feature	**RS_FEA_405**

The C2C-CC Basic System shall support services for confidentiality within the communication with the PKI entities.

Details:

Detailed by:

Feature	**RS_FEA_189**

The vehicle state estimation (see RS_FEA_427) shall include confidence intervals for a defined confidence level according to the definition in RS_FEA_428, for position, heading and velocity, as a standardized description of the estimation accuracy.

Details:

Detailed by:

Feature	**RS_FEA_430**

The C2C-CC Basic System shall provide services for communicating with other ITS-S by using ITS-G5, operating in the frequency band 5855 MHz to 5925 MHz.

Details:

Detailed by:

Feature	**RS_FEA_431**

The C2C-CC Basic System shall provide services to avoid channel congestion of the shared media.

Details:

Detailed by:

Feature	**RS_FEA_432**

The C2C-CC Basic System shall provide mitigation techniques to avoid disturbing other services operating at nearby frequencies (i.e. CEN DSRC).

Details:

Detailed by:

Feature	**RS_FEA_433**

The C2C-CC Basic System shall provide services for transmitting, receiving and forwarding messages to multiple, geographically scattered and movable entities.

Details:

Detailed by:

Feature   **RS_FEA_434**

The C2C-CC Basic System shall provide services for handling multiple messages of different types on the sender side.

Details:

Detailed by:

Feature   **RS_FEA_435**

The C2C-CC Basic System shall provide services for regularly transmitting information about itself and receiving of those information from other ITS-S in its vicinity.

Details:

Detailed by:

Feature   **RS_FEA_436**

The C2C-CC Basic System shall provide services for transmitting information about events on demand and receiving of those events from other ITS-S.

Details:

Detailed by:

Feature   **RS_FEA_437**

The C2C-CC Basic System shall use a standardized message format for each message type it exchanges with other ITS-S.

Details:

Detailed by:

Feature   **RS_FEA_438**

The C2C-CC Basic System shall check relevant host vehicle dynamics data (e.g. position, speed, heading, longitudinal acceleration, yaw rate) for plausibility.

Details:

Detailed by:

Feature   **RS_FEA_439**

The C2C-CC Basic System shall use certificates and signatures to ensure authentication of message originator.

Details:

Detailed by: