

## Features

### CAR 2 CAR Communication Consortium



**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 88 members, with 18 vehicle manufacturers, 39 equipment suppliers and 31 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 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.

The present document has been developed within the CAR 2 CAR Communication Consortium and might be further elaborated within the CAR 2 CAR Communication Consortium. The CAR 2 CAR Communication Consortium and its members accept no liability for any use of this document and other documents from the CAR 2 CAR Communication Consortium for implementation. CAR 2 CAR Communication Consortium documents should be obtained directly from the CAR 2 CAR Communication Consortium.

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### Document information

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Table 1: Document information

**Changes since last version**

**Title:** CAR 2 CAR Communication Consortium  
Features

**Explanatory notes:**

1	0	24.11.2016	Split former BSP into single documents for objectives, features and requirements as part of CAR 2 CAR Release 1.2.0	Henrik Antoni, Thomas Biehle, Robert Pflug
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Issue	Rev.	Date	Changes	Edited by	Approved
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**Table 2: Change history**

## Open Issues

The document should be handled as a working draft.

Technical specifications to be added:

- Wireless Performance
- Positioning Performance
- Protection Profile

**RS\_FEA\_152:** Definitions of terms, as used up to now in the BSP (derived from ETSI), does not completely match to the definition of terms as defined by release management (derived from AUTOSAR). Shall and should are the same, but the others differs.

**RS\_FEA\_176:**

- Using of pseudonym is missing. Only if pseudonyms are used, they can be changed.
- Definition of a pseudonym, how they are generated and their relation to privacy is missing.

**RS\_FEA\_189:**

- Maybe replace "under all driving conditions" with "as long as the system is active"?
- Maybe replace "confidence values" by "confidence intervals for a defined confidence level"? Confidence intervals and levels are common in statistics, but I had not found "confidence values" as a general term.

**RS\_FEA\_434:**

- Initial requirement was "The C2C-CC basic system shall provide services for handling multiple messages of different types on the sender and receiver side."
- Stefan Begerad: Why shall a basic system provide a service for handling multiple messages on the receiving side. That is a contradiction and conflicts with Requirement Quality in „RS\_FEA\_423“.
- Robert Pflug: At the CCB Meeting in Ulm was discussed, if maybe only the receiver side applications should be excluded from a C2C-CC specification, but the default stack behavior (sending and reception of messages) can be defined by C2C-CC. Based on that discussion, this requirement was written. It should target, that the basic system can transmit CAM and DENM as well as receive them and push them to the application layer. Maybe the wording is not clear.
- Robert Pflug: To be clear for the release, the "receiving side" was removed.

**RS\_FEA\_438:** This requirement is not clear about what vehicle is ment. „Vehicle dynamic data“ can originate in the host or in other ITS-Ss. That is a contradiction and conflicts with Requirement Quality in „RS\_FEA\_423“.

Do we need a feature like: "The C2C-CC basic system shall provide services for generating traces and path histories". Or do we cover this with the requirements for CAM and DENM?

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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 these 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.

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## 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 [C2C-CC ReOv] 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 details 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 details this feature, are tested.

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## 3 Conventions to be used

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### 3.1 Modal verbs terminology

#### Other (informational)

**RS\_FEA\_152**

In this document the following verbal forms are used to indicate requirements:

- Shall
- Shall not

Recommendations shall be indicated by the verbal forms:

- Should
- Should not

Permissions shall be indicated by the verbal forms:

- May
- May not

Possibility and capability shall be indicated by the verbal forms:

- Can
- Cannot

Inevitability, used to describe behavior of systems beyond of scope of this deliverable shall be indicated by:

- Will
- Will not

Facts shall be indicated by the verbal forms:

- Is
- Is not

### 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 or the organization providing them. For example normative requirements in ETSI documents are indicated by the verbal form “shall”.



When the requirements defined in the standards published by the various organizations stand in conflict, or contradict the requirements specified inside this document, the ones specified inside this document shall always outweigh the requirements included inside the referenced documents.

## 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...").

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## 4 References

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### 4.1 Normative references

Definition		RS_FEA_151
[C2C-CC ReOv]	CAR 2 CAR Communication Consortium Release Overview	
[EN 302 665]	EN 302 665 V1.1.1: Intelligent Transport System (ITS); Communications Architecture	

**Table 3: Normative references**

## 5 Definitions and abbreviations

### 5.1 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* comprises absolute position, time, heading and velocity.

**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 in 95% of the datasets in a given statistic base.

### 5.2 Abbreviations

**Other (informational)** **RS\_FEA\_150**

BSP	Basic System Profile
C2C-CC	Car2Car Communication 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 4: Abbreviations**

## 6 Feature specifications

**Feature** **RS\_FEA\_176**

The basic C2C-CC system shall change pseudonyms.

Details: RS\_OBJ\_408

Detailed by: RS\_BSP\_410

**Feature** **RS\_FEA\_405**

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

Details:

Detailed by:

Tested by:

**Feature** **RS\_FEA\_189**

A C2C-CC basic system shall be able to estimate the vehicle states (see RS\_FEA\_427) reliably under all driving conditions. The vehicle state estimation shall include confidence values 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:

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**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:

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**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:

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**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:

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**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:

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**Feature****RS\_FEA\_438**

The C2C-CC basic system shall check relevant vehicle dynamic data (position, speed, heading, longitudinal acceleration, yaw rate) for plausibility.

Details:

Detailed by:

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