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 (C2C-CC). 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). The Consortium members represent worldwide major vehicle manufactures, equipment suppliers and research organisations.

Over the years, the C2C-CC has evolved to be one of the key players in preparing the initial deployment of C-ITS in Europe and the subsequent innovation phases. C2C members focus on wireless V2V communication applications based on Direct Communication 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 C2C-CC and its members work in close cooperation with the European and international standardisation organisations.

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Document information

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Table 1: Document information

Changes since last version

Release	Date	Changes	Edited by	Approved
2.0.2	2025-12-19	Minor editorial changes	Release Management	Steering Committee
2.0.1	2024-07-12	initial document	Release Management	Steering Committee

Table 2: Changes since last version

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Introduction

Other (informational) **RS_FEA_147**

In terms of C2C-CC a feature defines a service or a major part of the vehicle C-ITS station. 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.

The present features focus on specifying the vehicle C-ITS station transmitting side (also by including all features from the previous C2C-CC Release 1 (see [C2CCC RelOv])). Moreover, this set of features is aimed at enabling, use cases of the Awareness Driving as well as of Sensing Driving, from a vehicle point of view (see also [C2CCC Roadmap]).

These use cases do not constitute a mandatory set to be implemented as part of a vehicle C-ITS station. A subset or a superset of them can be supported by a specific implementation of the vehicle C-ITS station.

Note: A particular vehicle C-ITS station mounted in any kind of vehicle as indicated in RS_OBJ_00149 of [objectives document] might not be able or is not designed to implement all features and to fulfil all requirements. But when a feature/requirement is implemented then it is required to be compliant with the C2C-CC specification.

Scope

Other (informational) **RS_FEA_146**

The present document provides all features in scope of a C2C-CC specifications-compliant vehicle sub-system to be available by the end (i.e. last version) of the current release (C2C-CC Release 2). This set of features is the consolidated and communicated understanding of the core vehicle system features in a vehicle C-ITS station.

Conventions used

Other (informational) RS_FEA_152

Conventions used in this and other C2C-CC specification documents can be found in [C2CCC ConV].

Definitions and abbreviations

Definition **RS_FEA_149**

'Vehicle C-ITS station' – a vehicle ITS station as defined in [EN 302 665] and further specified in this C2C-CC release.

Definition **RS_FEA_522**

'Confidence information' – information about estimated accuracy including confidence levels and intervals.

Definition **RS_FEA_429**

'Event – a road hazard or, driving environment condition that has a potential impact on road safety, or a traffic condition

Definition **RS_FEA_523**

'Value of information' – the estimated worth the information has for road safety.

Vehicle feature specification

Feature **RS_FEA_433**

The vehicle C-ITS station shall provide services for disseminating, receiving and forwarding C-ITS messages to multiple, geographically scattered entities.

Details: RS_OBJ_00426

Feature {#a} **RS_FEA_430**

The vehicle C-ITS station shall provide services for communicating with other C-ITS stations by using the vehicular ad-hoc Radio Local Area Network (RLAN), operating in the frequency band 5855 MHz to 5925 MHz.

Note: RLAN is defined in [EN 301 893].

Details: RS_OBJ_00426, RS_OBJ_00440

Feature **RS_FEA_502**

The C-ITS station shall provide services for access to multiple radio channels and estimate the corresponding channel capabilities.

Details: RS_OBJ_00426

Feature **RS_FEA_431**

The vehicle C-ITS station shall provide services to avoid channel congestion of the shared media.

Details: RS_OBJ_00426

Feature **RS_FEA_432**

The vehicle C-ITS station shall provide mitigation techniques to avoid disturbing other services operating at nearby frequencies (i.e. CEN DSRC as per [EN 15 509]).

Details: RS_OBJ_00426

Feature **RS_FEA_516**

The vehicle C-ITS station shall implement backwards compatible and standardised facility layer services and corresponding messages.

Details: RS_OBJ_00440

Feature **RS_FEA_524**

The vehicle C-ITS station shall provide facility layer services to process corresponding C-ITS messages received from vehicles with various characteristics (e.g. powered-two wheelers and trucks, retrofitted vehicles, etc.).

Details: RS_OBJ_00428

Feature **RS_FEA_525**

Vehicle C-ITS Stations shall implement profiling of facility layer services and corresponding messages to disseminate information reflecting their various characteristics (e.g. powered-two wheelers and trucks, retrofitted vehicles, etc.).

Details: RS_OBJ_00428,

Feature **RS_FEA_434**

The vehicle C-ITS station shall provide services for handling C-ITS messages of different types including the dissemination of messages generated at the host vehicle, as well as the reception of messages originated from other vehicle C-ITS Stations, roadside C-ITS Stations, central C-ITS stations and personal C-ITS Stations.

Details: RS_OBJ_00428, RS_OBJ_00440

Feature **RS_FEA_437**

The vehicle C-ITS station shall use a standardized C-ITS message format for each message type it disseminates, profiled according to the applicable requirements.

Details: RS_OBJ_00428, RS_OBJ_00440

Feature **RS_FEA_520**

The vehicle C-ITS station shall have access to trustworthy and accurate time information.

Details: RS_OBJ_00427, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_189**

The vehicle C-ITS station shall have access to trustworthy and accurate host vehicle state information (e.g. absolute position, heading and speed) including confidence information (see FEA_RS_ RS_FEA_522).

Details: RS_OBJ_00427, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_526**

The vehicle C-ITS station shall have access to trustworthy and accurate host vehicle

information as needed for the detection of events.

Details: RS_OBJ_00427, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_519**

If the vehicle is equipped with local environment perception sensors, the C-ITS station shall have access to trustworthy information about the perceived objects and sensor/perception regions, including confidence information (see RS_FEA_522).

Details: RS_OBJ_00446, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_438**

The vehicle C-ITS station shall check relevant host vehicle dynamics information (e.g. position, speed, heading, longitudinal acceleration, yaw rate, etc) for plausibility and only use valid information for further processing or dissemination.

Details: RS_OBJ_00431

Feature **RS_FEA_438**

The vehicle C-ITS station shall check relevant host vehicle information usable for event detection for plausibility and only use valid information for further processing or dissemination.

Details: RS_OBJ_00431

Feature **RS_FEA_510**

The vehicle C-ITS station shall check the plausibility of perceptions by local environment perception sensors and only use valid information for further processing or dissemination.

Details: RS_OBJ_00431

Feature **RS_FEA_511**

The vehicle C-ITS station shall process information about perceived objects only when these meet defined confidence requirements. Confidence requirements shall apply to host vehicle data as well as perception data.

Details: RS_OBJ_00446, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_521**

The vehicle C-ITS station shall select perceived objects according to standardized definitions of the value of information of the perceived object as well as the available channel capabilities.

Details: RS_OBJ_00446, RS_OBJ_00431, RS_OBJ_00435

Feature **RS_FEA_435**

The vehicle C-ITS station shall provide services for regularly disseminating C-ITS messages about the vehicle C-ITS subsystem where it is contained and for receiving such information from other C-ITS stations in its vicinity. The information to disseminate includes station and vehicle information (e.g. time, location, dynamics, active systems, etc. as achieved from in-vehicle networks) and attributes (e.g. dimension, type, role in the road traffic, etc.) of the host vehicle C-ITS subsystem.

Details: RS_OBJ_00427

Feature **RS_FEA_507**

A vehicle C-ITS station with access to data describing the predicted path of the vehicle (e.g. from motion estimators or automated system planners) should disseminate it in addition to the information of RS_FEA_435.

Details: RS_OBJ_00427

Feature **RS_FEA_506**

A vehicle C-ITS station with access to data describing the expected route of the vehicle at a signalized intersection (e.g. from navigation systems or automated system planners) should disseminate it in addition to the information of RS_FEA_435.
Note: This enables receiver Roadside or Central C-ITS Stations to provide useful information to traffic light controller management systems at signalized intersections.

Details: RS_OBJ_00447

Feature **RS_FEA_436**

The vehicle C-ITS station shall provide services for disseminating C-ITS messages about events detected using triggering conditions based on information obtained from the host vehicle C-ITS subsystem. These services shall also allow receiving information about events detected and disseminated by other C-ITS stations.

Details: RS_OBJ_00427

Feature **RS_FEA_440**

A vehicle C-ITS station with access to data from digital maps and/or road layout detection systems (e.g. on-board cameras) should make use of those data to share road configuration information in addition to the information of RS_FEA_436.
Details: RS_OBJ_00436

Feature **RS_FEA_503**

A vehicle C-ITS station with access to data from digital maps and/or road layout detection systems (e.g. on-board cameras) should map the location information obtained from the host

vehicle C-ITS subsystem to specific lane(s) and disseminate the applicable lane(s) in addition to the information of RS_FEA_435 and RS_FEA_436.
Note: This enables receiver vehicle C-ITS Stations to contextualize information about the disseminating vehicle or disseminated event on one or multiple specific lanes.

Details: RS_OBJ_00436

Feature **RS_FEA_509**

The vehicle C-ITS station implementing RS_FEA_519 shall provide services for regularly disseminating C-ITS messages about the vehicle´s perception region(s) and about objects perceived within those perception region(s). The services shall also allow for receiving such information from other C-ITS stations in its vicinity.

Details: RS_OBJ_446

Feature **RS_FEA_512**

The vehicle C-ITS station shall provide information received from other C-ITS Stations for usage by the vehicle´s Automated Driving System(s).

Note: the intention is that the vehicle´s Automated Driving System(s) can better asses the operational conditions and/or extend the geographical area in which they can operate inside of its Operational Design Domain (ODD) and/or improve the vehicle´s Automated Driving System(s) performance inside the ODD.

Details: RS_OBJ_00429

Feature **RS_FEA_517**

The vehicle C-ITS station shall extend RS_FEA_435 to support driving automation system features like Cooperative Adaptive Cruise Control.
Note: This can include adapted generation rules and channel assignments.

Details: RS_OBJ_429

Feature **RS_FEA_439**

The vehicle C-ITS station shall use certificates (Authorization Tickets) and corresponding signatures to ensure authentication of message originator.

Details: RS_OBJ_00157

Feature **RS_FEA_405**

The vehicle C-ITS station shall support a trust model based on asymmetric cryptography with public key certificates and implement communications security services at the ITS security reference points within a single common European Cooperative-ITS Security Certificate Management System with Certificate Trust List / Trust List manager.

Details: RS_OBJ_00441

Feature **RS_FEA_501**

The vehicle C-ITS station shall implement rules and guidelines for ITS station security management.

Details: RS_OBJ_00441

Feature **RS_FEA_176**

The vehicle C-ITS station shall change the authorization tickets that are attached to the messages it originates.

Details: RS_OBJ_00408

Feature **RS_FEA_508**

The vehicle C-ITS station should be able to process received C-ITS messages, check other vehicles' dynamics data as provided by its vehicle C-ITS station (e.g. position, speed, heading, longitudinal acceleration, yaw rate) and report discrepancies to the Misbehaviour Authority.

Details: RS_OBJ_438

Feature **RS_FEA_513**

The vehicle C-ITS station shall implement functional safety mechanisms to qualify from an ASIL perspective the content of shared information, as well as the mechanisms themselves, according to generalized C-ITS application safety targets, using standardized data frames complementing the messages in a backward compatible way.

Note: Permission to add such data frames would be associated to a European wide certification scheme.

Note: the generalisation of C-ITS application safety targets means that the qualification information in the standardised data frames does not necessarily refer directly to specific use cases but rather to the properties of shared information.

Details: RS_OBJ_00437

Appendix

C-ITS features

Other (informational) **RS_FEA_ 00526**

This chapter covers the:

- Overall;
- Requests/assumptions on infrastructure and
- Requests/assumptions on backend

features, as put into context in Figure 1 of the R2 C2C-CC Objectives and seen from a C2C-CC perspective.

Note: this clause and the following sub clauses will be elaborated together with our cooperation partners, in the field of infrastructure and back backend standardization.

Overall

Tbd.

Requests/assumptions infrastructure features

Tbd.

Requests/assumptions backend features

Tbd.

Known Issues

The following issues in this document are known:

- The clause on ‘C-ITS features’ needs to be elaborated together with our cooperation partners, in the field of infrastructure and backend standardization.