



# **C-ITS SERVICE AND USE CASE DEFINITIONS**

**INTRO DOCUMENT  
[C-ROADS SUD01]**

**VERSION 3.1.0**

C-Roads Platform

Working Group 2 Technical Aspects

Taskforce 2 Service Harmonisation

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## Publication History

*Note: The publication history of releases 1.x and 2.x can be found in the release 2.3.0 documentation.*

Version	Date	Description, updates and changes	Status
3.0.0	19.08.2025	<p>Replaced all use cases of RWW (Chapter 4) by a completely new structure of describing Roadworks Warnings.</p> <p>Only the use case for Winter Maintenance is temporarily left over in chapter 4 and will be moved into a new service category in future versions of this document.</p> <p>Included two new use cases in Automated Vehicle Guidance: AVG-VDI and AVG-VSI</p> <p>Updated the two IVS use cases IVS-TS and IVS-FT.</p> <p>The Test and validation requirements of each use case are no longer denoted in this document but can be found in [C-Roads_TVC] and [C-Roads_TP].</p> <p>Minor corrections</p>	Final
3.0.0	01.09.2025	Splitted the document into a base document (this one) and separate service category documents	Final
3.1.0	01.11.2025	<p>Added [C-ROADS SUD11] to the document series.</p> <p>Updated chapters 1.1 and 1.2.</p>	Final

## Acronyms

Acronym	Explanation
ABS	Anti-lock Braking System: operates by preventing the wheels from locking while braking, thereby maintaining tractive contact with the road surface.
ACC	Adaptive Cruise Control
ADAS	Advanced Driver Assistance System
ADS	Automated Driving System
AMQP	Advanced Message Queuing Protocol
AT	Authorisation Ticket
AVG	Automated Vehicle Guidance
AVG-PSI	Automated Vehicle Guidance – Platoon Support Information
AVG-SAELG	Automated Vehicle Guidance – SAE Level Guidance
AVG-VDI	Automated Vehicle Guidance – Vehicle Distance Information
AVG-VSI	Automated Vehicle Guidance – Vehicle Speed Information
C2C	Car 2 Car
CAM	Cooperative Awareness Message
CC	causeCode
C-ITS	Cooperative Intelligent Transport Systems
C-ITS station	A set of hardware and software components required to collect, store, process, receive and transmit secured and trusted messages in order to enable the provision of a C-ITS service. This includes personal, central, vehicle and roadside ITS stations as defined in EN 302 665 v 1.1.1
C-ITS-S	Central C-ITS Station, is realised by a set of hardware and/or software components installed in the back office of the C-ITS service provider e.g. a Traffic Management Centre or a Fleet Management Centre
DENM	Decentralised Environmental Notification Message
CPM	Collective Perception Message
CP-MW	Collective Perception - Motorways
CP-UI	Collective Perception - Urban Intersections
DF	Data Frame
ESC	Electronic Stability Control: a computerised technology that improves a vehicle's stability by detecting and reducing loss of traction
ESVN	Emergency and Service Vehicle Notifications
ESVN-EPVA	Emergency and Service Vehicle Notifications – Emergency or Prioritised Vehicle Approaching

Acronym	Explanation
ESVN-ERVI	Emergency and Service Vehicle Notifications – Emergency, Rescue/Recovery or Maintenance Vehicle in Intervention
ESVN-SMMV	Emergency and Service Vehicle Notifications – Slow Moving Maintenance Vehicle
ESVN-WM	Emergency and Service Vehicle Notifications – Winter Maintenance
ETSI	European Telecommunications Standards Institute
ETSI ITS G5	See ITS-G5
EU	European Union
EV	Emergency Vehicle
FLM	Fleet Management System
GDPR	General Data Protection Regulation
HGV	Heavy Goods Vehicle
HLN	Hazardous Location Notification
HLN-APR	Hazardous Location Notification – Animal or Person on the Road
HLN-AWWD	Hazardous Location Notification – Alert Wrong Way Driving
HLN-AZ	Hazardous Location Notification – Accident Zone
HLN-OR	Hazardous Location Notification – Obstacle on the Road
HLN-PTVC	Hazardous Location Notification – Public Transport Vehicle Crossing
HLN-PTVS	Hazardous Location Notification – Public Transport Vehicle at a Stop
HLN-RLX	Hazardous Location Notification – Railway Level Crossing
HLN-SV	Hazardous Location Notification – Stationary Vehicle
HLN-TJA	Hazardous Location Notification – Traffic Jam Ahead
HLN-TSR	Hazardous Location Notification – Temporarily Slippery Road
HLN-UBR	Hazardous Location Notification – Unsecured Blockage of a Road
HLN-WCW	Hazardous Location Notification – Weather Condition Warning
HMI	Human Machine Interface
Hz	Hertz
I2V	Infrastructure to Vehicle Communication; Information exchange between infrastructure and vehicles.
ID	Identifier
ISO	International Organisation for Standardization
ITS	Intelligent Transport Systems
ITS-G5	ITS-G5 is a European standard for ad-hoc short-range communication of vehicles among each other (V2V) and with Road ITS Stations (V2I). The ITS-G5 Access layer specification for

Acronym	Explanation
	Intelligent Transport Systems operating in the 5 GHz frequency band is given in ETSI EN 302 663. ITS-G5 is a profile of the amendment IEEE 802.11p, which has been incorporated into the main IEEE 802.11 standard, and an IEEE 802.2 LLC. It uses the 5.9 GHz frequency band to support safety- and non-safety ITS applications.
IVI	In-Vehicle Information
IVIM	Infrastructure to Vehicle Information Message
IVS	In-Vehicle Signage
IVS-TS	In-Vehicle Signage – Traffic Signs
IVS-FT	In-Vehicle Signage – Free Text
km	Kilometre
MAP	Topology information for the intersection
MAPEM	MAP Extended Message
ms	Millisecond
NG	Navigation Guidance
NG-RA	Navigation Guidance – Route Advice
NG-SR	Navigation Guidance – Smart Routing
NG-TSA	Navigation Guidance – Toll Station Approaching
OBUE	On Board Unit
OEM	Original Equipment Manufacturer
OHLN	Other Hazardous Location Notifications
PA-FLS	Parking Availability Facility Layer Service
PCAP	Packet Capture
PVD	Probe Vehicle Data
POI	Points of Interest
POI-PA	Points of Interest – Parking Availability
PVD-EDC	Probe Vehicle Data – Event Data Collection
PVD-VDC	Probe Vehicle Data – Vehicle Data Collection
PT	Public Transport
PTW	Power Two Wheelers
RHS	Road Hazard Signalling
R-ITS-S	Roadside ITS Station (the so-called RSU)
RO	Road Operator

Acronym	Explanation
RSU	Roadside Unit (See R-ITS-S)
RWW	Road Works Warning
SAE	Society of Automobile Engineers ( <a href="http://www.sae.org">www.sae.org</a> )
sCC	subCauseCode
SI	Signalised Intersections
SI-EVP	Signalised Intersections – Emergency Vehicle Priority
SI-GLOSA	Signalised Intersections – Green Light Optimal Speed Advisory
SI-ISVW	Signalised Intersections – Imminent Signal Violation Warning
SI-SPTI	Signalised Intersections – Signal Phase and Timing Information
SI-TLP	Signalised Intersections – Traffic Light Prioritisation
SI-TSC	Signalised Intersections – Toll Station Crossing
SPAT	Signal Phase And Timing
SPATEM	Signal Phase And Timing Extended Message
SREM	Signal Request Extended Message
SSEM	Signal request Status Extended Message
SSP	Service Specific Parameters
TCC	Traffic Control Centre
TF2	Task Force 2
TF3	Task Force 3
TMS	Traffic Management System
TCC	Traffic Control Centre
UK	United Kingdom
V-ITS-S	Vehicle ITS Station
V2I	Vehicle to Infrastructure communication; Information exchange between vehicles and infrastructure.
V2V	Vehicle to Vehicle Communication; information exchange between vehicles.
V2X	Vehicle to any communication; X is either infrastructure or car; Including communication between vehicles as well as between vehicles and infrastructure.
V <sub>ev</sub> 2V	Emergency Vehicle to Vehicle communication; information exchange between emergency vehicles and other vehicles
VDS	Variable Direction Signs
VMS	Variable Message Signs

Acronym	Explanation
V <sub>PT</sub> 2V	Public Transport Vehicle to Vehicle communication; information exchange between public transport vehicles and other vehicles
V <sub>ro</sub> 2V	Road operator vehicle to vehicle; information exchange between road operator vehicles and other vehicles
VRU	Vulnerable Road User
VTP	Variable Text Panels
WG2	Workgroup 2
WW	Wrong-Way (see HLN-AWWD)
WWD	Wrong-Way Driving (see HLN-AWWD)

Acronym	Explanation
e.g.	In Latin “exempli gratia” which stands for: “For Example”
i.e.	In Latin “id est” which stands for “In other words”

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This introduction document only covers the first chapter of the service and use case descriptions and introduces the structure of the service and use case descriptions.

The service categories and the use cases are described in separate documents, each covering one chapter with one service category and the respective use cases (**chapters 2 – 11**). See paragraph 1.4 for the details.

# 1. Introduction

## 1.1 C-Roads platform for harmonisation of C-ITS deployment

The C-Roads Platform is a joint initiative of European Member States and road operators for testing and implementing C-ITS services in light of cross-border harmonisation and interoperability. Through the C-Roads Platform, authorities and road operators join together to harmonise the deployment activities of cooperative intelligent transport systems (C-ITS) across Europe. The goal is to achieve the deployment of interoperable cross-border C-ITS services for road users.

C-ITS enables vehicles to interact directly with each other and the surrounding road infrastructure. In road transport, C-ITS typically involves vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication. In order to enable an efficient and undisturbed exchange of information within these services as well as a cross-border implementation, harmonised C-ITS specifications are indispensable. The approach starts from a functional perspective, then requirements applicable to all implementations and then towards technology specifications of currently validated implementations (ITS-G5 for short range communication, IP based for long range cellular). In order to meet these challenges, the C-ROADS platform is divided into four Working Groups. The first Working Group is concerned with organisational tasks, the second with Technical Aspects and the third with Evaluation and Assessment. The fourth Working Group is about Digital Transport Infrastructure (DTI). Next to these working groups there are 3 collaboration groups (Blue-light, Urban and Rail) which interact on specific thematical topics with the working groups, The last working group Strategy and Operations focuses on the setup of a structure for permanent operation of the infrastructure-based European C-ITS system and networks in a multi-stakeholder environment.

The C-Roads Platform is steered by the C-Roads Steering Committee which is composed by Member State representatives. With the support of the Supporting Secretariat, decisions for achieving the goal of the implementation of interoperable end-user services are taken. In this respect specifications, plans and reports, which are proposed and recommended by specific Working Groups, are approved. Within WG2 these specifications are harmonized in 5 Task Forces and derived from pilot and implementation activities and the basis for further pilot and implementation activities. This especially goes with technical decisions, which influence deployment and procurement decisions at pilot sites.

The Working Groups are installed as decision support for the Steering Committee to ensure proper decisions towards interoperable deployments. Individual experts participating in the single pilots work together in these Working Groups to prepare proposals and recommendations.

The content of the WG2 documentation is based on input from actual implementations and was harmonised in C-Roads task forces and working group. Specifications of additional implementations can be provided to C-Roads and will be incorporated into the document through the harmonisation process.



Figure 1:1 Overview of C-Roads coverage

## 1.2 Story board C-Roads C-ITS deployment documentation

This document is part of the C-Roads C-ITS Deployment Documentation and Requirements. The complete set of documents is much related to a common project life cycle of a system implementation. As a guide to the C-Roads Documentation, a story board based on such a project life cycle is provided in this section, with emphasis on the role of this document C-ITS Service and Use Case Definitions. The story board should be read from left to right and shows the different stages of the project life cycle and how each C-Roads Documentation is related to it, thereby it can be supportive to road authorities and other stakeholders.

A complete description of the story board of a C-ITS implementation project, the different stages and the related C-Roads documents is given in [Introduction to the C-Roads WG2 Deployment Documentation and Requirements].

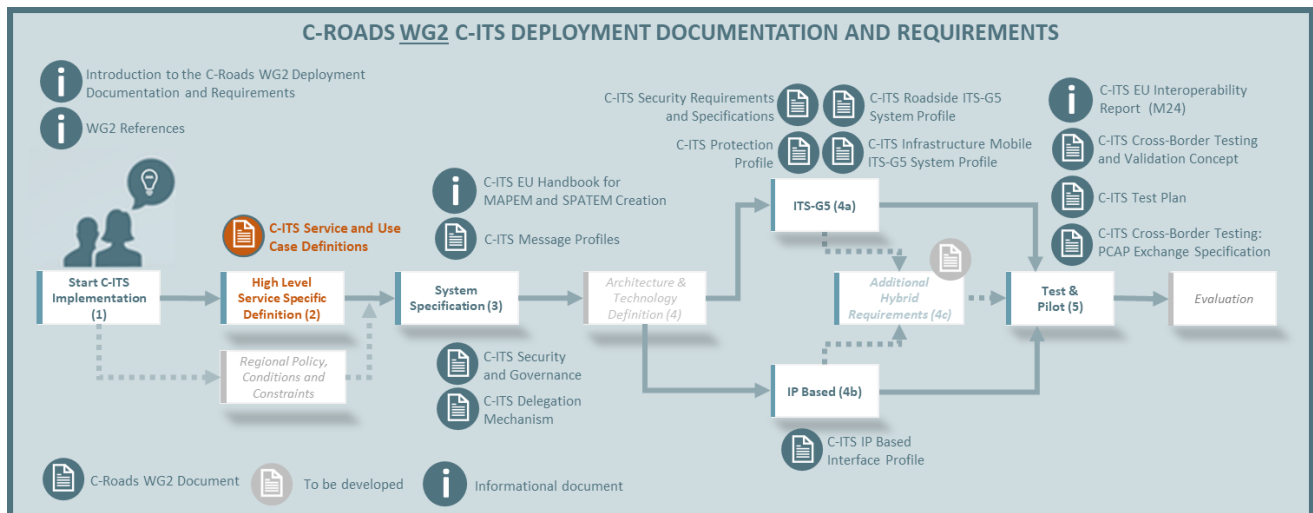


Figure 1:2: highlight of WG2 document in complete story board

The documents cover a wide range of aspects related to several stages as described in section 1.4 of [Introduction to the C-Roads WG2 Deployment Documentation and Requirements]. Starting with stage 3, generic requirements and the required governance are specified - those are applicable for all services, use cases and scenarios in a similar way. On stage 4a and 4b, the more detailed specifications are relevant - including service specific security requirements. Both levels, generic and specific requirements, have impact on the test cases derived on stage 5.

### 1.3 Scope of this document set

This document set (introduction chapter and the service category chapters) covers stage 2, where services and use cases are described in a functional way. It also provides for each use case the generic reference to the required specific documentation of the C-Roads WG 2 and the harmonised specific use case settings in order to achieve interoperability. These functional descriptions are the result of the harmonisation efforts that have taken place within TF2 (Service Harmonisation) and the alignment with the work of the other C-Roads WG2 task forces where the harmonisation of the interoperability requirements for the specific services and use cases takes place.

In the C-ITS service context the following terminology is used:

- Service: a clustering of use cases based on a common denominator, for example, an objective such as awareness or a context like road works. Services are also known as ‘applications’.
- Use case: function of the system, the desired behaviour (of the system and actors), specification of system boundaries and definition of one or more usage scenarios.
- Situation: relevant situation (everything required to describe a static snapshot) considering (driving) function-related goals and values.
- Scenario: temporal development of a sequence of situations (e.g. initial and after) based on events and actions. It is story telling.
- Actors: external (human) entities that interact with the system. The system affects and is affected by the behaviour of actors; these interactions are described in the use case descriptions.

Basic principle: “information need + context (situation) = use case”. Meaning that:

- A different information need in the same context results in a new use case.
- The same information need in a different context results in a new use case.

However, note that the functional description of these use cases may seem to be largely identical as the main differences might become apparent only when reading the high-level technical descriptions. This document contains functional descriptions, not high-level technical descriptions, which are described in a technology agnostic way (where possible).

It is important not to confuse 'service' with 'use case'. Therefore, it is important to clearly refer to the information need and the context of use within a specific use case. Similarly, services should be defined carefully and economically as the one-to-many relationship between services and use cases may lead to a nearly infinite number of services.

Next to the functional description of the specific use cases, the specific interoperability requirements are included in the last part of the template. It contains generic references to the other C-Roads requirements documentation as well the use case specific harmonised settings needed for interoperability.

All References (in square brackets) refer to the global reference document [WG2 REF], which is part of the whole set of documents of a specific C-Roads release.

The following format is used to describe the services:

Service introduction	
Summary	A summary of the service (one or two lines)
Background	A description of the motivation/rationale of the service
Objective	The intended outcome of the service
Expected benefits	A description of the expected added value and actor benefits of the service
Use cases	A list of use cases – for each listed use case, a use case table needs to be provided

The following format is used to describe the use cases:

Type of road network	One or more of: <ul style="list-style-type: none"> <li>• All</li> <li>• Motorways (physically separated by design)</li> <li>• Dual carriageways (physically separated)</li> <li>• Rural roads (physically separated / not physically separated)</li> <li>• Urban roads (physically separated / not physically separated)</li> <li>• Intersections</li> </ul>
Type of vehicle (receiver) (sender for PVD)	Targeted vehicles by the information in the message; In case of PVD the sending vehicle type
Use case introduction	
Summary	A summary of the use cases (one or two lines)
Background	A description of the motivation/rationale of the use case
Objective	The intended outcome of the use case
Desired behaviour	A description of the expected behaviour of the system and the intended behaviour of users
Expected benefits	A description of the expected added value and actor benefits
Use case description	
Situation	A description of one or more situations relevant to the use case A specification of the triggering conditions for starting and terminating the use case.

Logic of transmission	The transmission logic to be used (I2V, V2V). For V2V, different vehicle roles may be distinguished. Also V2I can be used when it concerns data received from vehicles by the infrastructure side.
Actors and relations	A list of all relevant actors and their relations/interactions with the system and their role in the use case (incl. sender and receiver). The actors are: drivers (including PTW riders), road operators, service providers, end-users, vulnerable road users and others.
Use case scenario	A description of the story of the use case based on a sequence of situations (e.g., initial and after), events and actions, with illustrations. Sender and receiver should be addressed, in stakeholder neutral manner.
Intended Presentation/Alert principle	What is presented to the user and when.
Functional constraints / dependencies	A description of functional constraints and dependencies that are requirements (if any) related to e.g., business, security, telecommunications, privacy, legal, human behaviour, etc.
Link to other use cases	A list of other uses cases to which the use case is linked and a description of the link
<b>Interoperability requirements</b>	
Message profile requirements	Generic reference to the TF3 message profile document [C-Roads MP] and use case specific settings are described.
Security and data protection requirements	Generic reference to the TF1 documents [C-ITS Security Requirements and Specifications] and [C-ITS Security and Governance] and use case specific settings are described.
Communication technology requirements: ITS-G5	Generic reference to the TF3 documents “C-ITS Roadside ITS-G5 System Profile” [C-Roads RSP] and “C-ITS Infrastructure Mobile ITS-G5 System Profile” [C-Roads MSP] and use case specific settings are described.
Communication technology requirements: IP based	Generic reference to the TF4 document [C-ITS IP Based Interface Profile] and use case specific settings are described.
Test and validation requirements	Generic reference to the TF5 documents “C-ITS Cross-Border Testing and Validation Concept” [C-Roads_TV] and “C-ITS Test Plan” [C-Roads_TP]. All the tests are important for technical interoperability if the use-case is implemented in the MS. These tests were directly derived from the specifications and interoperability requirements.

## 1.4 Overview service-category documents and use-cases

In this document set the following service-categories and use cases are described, each service in an extra document:

Chapter / Service Document name	Use Case	First release
<b>2 In-Vehicle Signage</b> C_Roads_WG2_TF2_Service and Use Case Definitions 02 IVS 3.1.0 [C-Roads SUD02]	Traffic Signs (IVS-TS)	2.0.0
	Free Text (IVS-FT)	2.0.0
<b>3 Hazardous Location Notification</b> C_Roads_WG2_TF2_Service and Use Case Definitions 03 HLN 3.1.0 [C-Roads SUD03]	Accident Zone (HLN-AZ)	1.0
	Traffic Jam Ahead (HLN-TJA)	1.1
	Stationary vehicle (HLN-SV)	1.1
	Weather Condition Warning (HLN-WCW)	1.1
	Temporarily slippery road (HLN-TSR)	1.1
	Animal or person on the road (HLN-APR)	1.1
	Obstacle on the road (HLN-OR)	1.1
	Railway Level Crossing (HLN-RLX)	1.5
	Unsecured Blockage of a Road (HLN-UBR)	1.6
	Alert Wrong Way Driving (HLN-AWWD)	1.6
	Public Transport Vehicle Crossing (HLN-PTVC)	1.6
	Public Transport Vehicle at a Stop (HLN-PTVS)	1.6
<b>4 Road Works Warning</b> C_Roads_WG2_TF2_Service and Use Case Definitions 04 RWW 3.1.0 [C-Roads SUD04]	<i>[This service category document is not organised in terms of use-cases]</i>	1.5
<b>5 Signalised Intersections</b> C_Roads_WG2_TF2_Service and Use Case Definitions 05 SI 3.1.0 [C-Roads SUD05]	Signal Phase and Timing Information (SI-SPTI)	2.0.3
	Green Light Optimal Speed Advisory (SI-GLOSA)	2.0.3
	Imminent Signal Violation Warning (SI-ISVW)	2.0.3
	Traffic Light Prioritisation (SI-TLP)	2.0.3
	Emergency Vehicle Priority (SI-EVP)	2.0.3
	Toll Station Crossing (SI-TSC)	2.1.0

<b>6 Automated Vehicle Guidance</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 06 AVG 3.1.0 [C-Roads SUD06]	SAE Level Guidance (AVG-SAELG)	2.0
	Platoon Support Information (AVG-PSI)	2.0
	Vehicle Distance Information (AVG-VDI)	3.0.0
	Vehicle Speed Information (AVG-VSI)	3.0.0
<b>7 Navigation Guidance</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 07 NG 3.1.0 [C-Roads SUD07]	Toll Station Approaching (NG-TSA)	2.0.9
	Smart Routing (NG-SR)	2.1.0
	Route Advice (NG-RA)	2.3.0
<b>8 Collective Perception</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 08 CP 3.1.0 [C-Roads SUD08]	Collective Perception on Motorways (CP-MW)	2.1.1
	Collective Perception on Urban/Interurban Intersections (CP-UI)	2.1.1
<b>9 Points of Interest</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 09 POI 3.1.0 [C-Roads SUD09]	Parking Availability (POI-PA)	2.2.0
<b>10 Probe Vehicle Data</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 10 PVD 3.1.0 [C-Roads SUD10]	Vehicle Data Collection (PVD-VDC)	1.5
	Event Data Collection (PVD-EDC)	1.5
<b>11 Emergency and Service Vehicle Notifications</b>  C_Roads_WG2_TF2_Service and Use Case Definitions 11 ESVN 3.1.0 [C-Roads SUD11]	Emergency or Prioritised Vehicle Approaching (ESVN-EPVA)	3.1.0 (was HLN-EPVA since 2.04)
	Emergency, Rescue/Recovery or Maintenance Vehicle in Intervention (ESVN-ERVI)	3.1.0 (was HLN-ERVI since 2.03)
	Slow Moving Maintenance Vehicle (ESVN-SMMV)	3.1.0
	Winter Maintenance (ESVN-WM)	3.1.0 (was RWW-WM since 1.5)