Interoperability Guide on Local Hazards

Version 1.0

Euro NCAP, the European New Car Assessment Program, includes “Local Hazards” in its Safe Driving Vehicle Assistance Protocol[1] for 2026. Local Hazard warnings help drivers to drive attentively and prepare for upcoming hazards. For Direct Communication, the EURO NCAP Program refers to the C-ROADS specifications, which explain when to send and how to interpret these hazard warnings, so that they can be understood in the same way throughout Europe. This document provides guidance to OEMs on how to implement Local Hazards via direct communication and demonstrate interoperability with C-ROADS according to the Euro NCAP protocol. Especially newcomers in this field will find useful references to specification documents within this document.

How to demonstrate interoperability

The C-ROADS specifications contain all requirements for interoperability of the described services and use cases. The full C-ROADS specifications can be found here: https://releases.c-roads.eu/.

Interoperability with C-ROADS is based on three pillars: (1.) a *system profile* for general requirements such as localisation, electronic signatures etc., (2.) a *message profile* for the format and content of the messages describing an event, and (3.) a *use case profile/description* for the use-case specific information and triggering conditions.

Interoperability Requirements	Reference
Use Case Profile	C-ROADS Service and Use Case Definitions [1] (see Mapping tables below)
Message Profile	C-ROADS Message Profile [2] (for DEN basic service and CA basic service)
System Profile	C-ROADS MSP [3] or C2C BSP [4]

In addition, the C-ROADS Security requirements & specifications apply, so that messages can be exchanged within an environment, where sender and receiver can trust each other.

Use Case Overview

The following tables show how to map C-ROADS use cases to their Euro NCAP equivalent. C-ROADS specifications describe use cases from an infrastructure point of view. Interoperability with C-ROADS means to be able to *receive* local hazard information as described in the C-ROADS service and use case definitions and inform the driver. It also means to *send* information so that infrastructure and other vehicles can use this information – the latter is described in the probe vehicle data service of C-ROADS, because a sent data from a vehicle’s perspective is probe data from the infrastructure perspective.

[1] https://www.euroncap.com/media/85818/euro-ncap-protocol-safe-driving-vehicle-assistance-v10.pdf

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Receiving and Informing

A vehicle receives data and informs the driver.

Euro NCAP Local Hazards [8]	C-ROADS Use Case [1] of the Road Works Warning and Hazardous Location Notification Service
Construction zones	Lane Closure and other restrictions
Items on road	Obstacle on the Road
Stopped vehicle	Stationary Vehicle (stationary vehicle)
Broken down vehicle	Stationary Vehicle (broken down vehicle)
Post crash	Accident Zone (I2V) *Equivalent C2C use case for V2V: Stationary Vehicle Warning (Post-crash)*
Poor weather	Weather Condition Warning
Poor road	Temporarily Slippery Road
Wrong way driver	Alert Wrong Way Driver
Amber + Blue lights	Emergency or Rescue/Recovery Vehicle in Intervention
	Emergency or Prioritised Vehicle Approaching
Traffic jam	Traffic Jam Ahead (I2V) *Equivalent C2C use case for V2V: Traffic condition*

Sending

A vehicle sends data

Euro NCAP Local Hazards [8]	C-ROADS Use Case [1] of the Probe Vehicle Data Service
Construction zones	Construction zone and road works location validation
Items on road	Obstacle on the road
Stopped vehicle	Stationary vehicle (stopped vehicle, broken-down vehicle, post-crash)
Broken down vehicle	
Post crash	
Poor weather	Adverse weather conditions (fog, precipitation)
	Poor weather condition
Poor road	Adverse weather conditions (adhesion)
Wrong way driver	Wrong-way driver
Amber + Blue lights[1]	Emergency or Prioritised Vehicle Approaching
	Emergency or Rescue/Recovery Vehicle in Intervention
Traffic jam[2]	Traffic condition

[1]) restricted to special vehicles, not applicable in Euro NCAP 2026. Part of Hazardous Location Notification (Service)
[2]) specifications available, but not applicable for "Sending" in Euro NCAP 2026

Service Provision via Direct Communication

In direct communication, a service or use case is provided by the vehicle itself – there is no additional service provision needed on the OEM's side. Sending and receiving is based on the same profiles. Therefore, a receiving vehicle can always understand a local hazard in the same way, independent of whether it has been sent by another vehicles, by the infrastructure or by a special vehicle (Figure 1). The information about the sender helps to understand how a message is triggered. If a vehicle sends local hazard information, this message will be directly available to other vehicles, but also for the infrastructure, which might aggregate the data. Furthermore, direct communication is also able to forward messages (Figure 2).

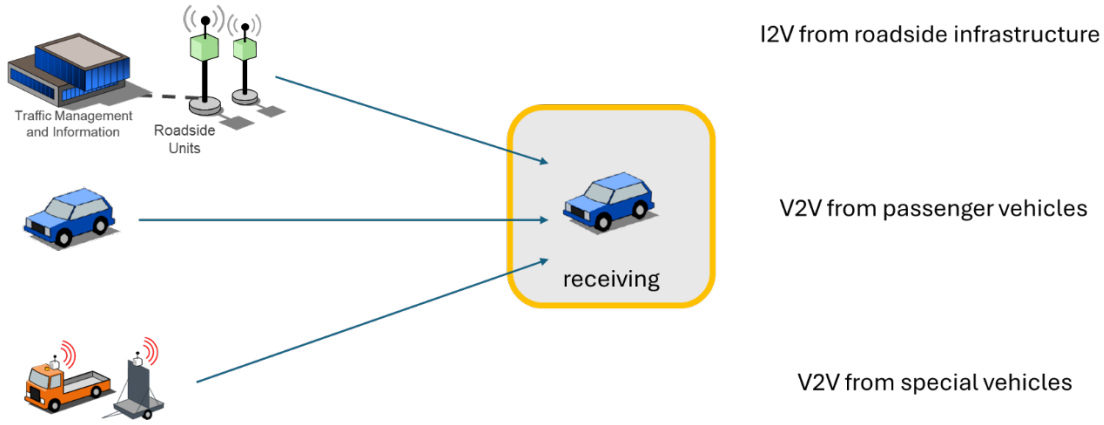

Figure 1 – Possibilities of receiving local hazard information

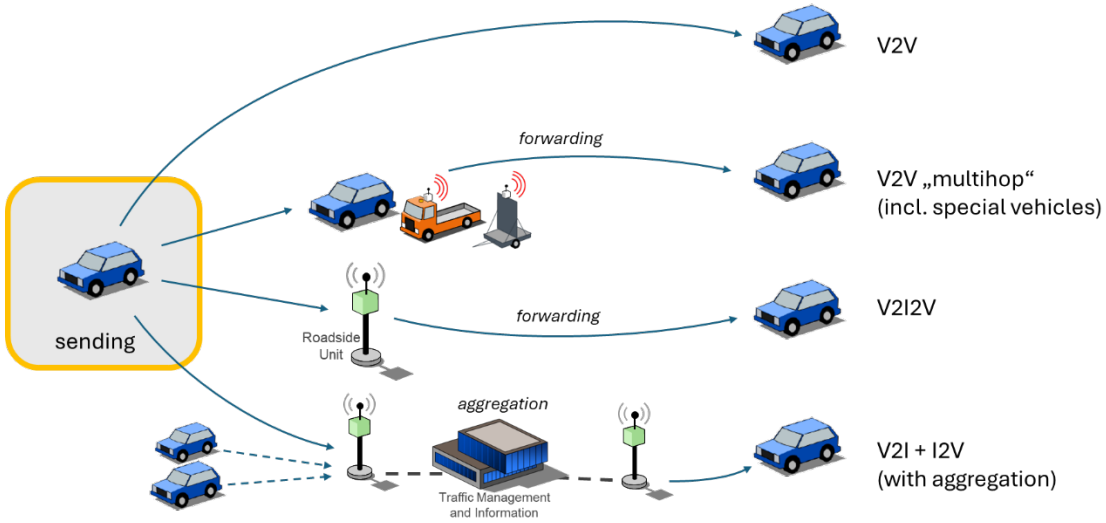

Figure 2 - Sending local hazard information

Detailed Use Case Mapping

Receiving and Informing

Receiving by a vehicle and informing the driver

Euro NCAP Local Hazards [8]	C-ROADS Use Case	Abbreviation	Message	Cause Code	Subcause Code
Construction zones	RWW - Lane Closure and other restrictions [1]	RWW-LC	DENM	3	0,4
Items on road	HLN - Obstacle on the Road [1]	HLN-OR	DENM	10	0-5
Stopped vehicle	HLN - Stationary Vehicle [1]	HLN-SV	DENM	94	0
Broken down vehicle	HLN - Stationary Vehicle [1]	HLN-SV	DENM	94	2
Post crash	HLN - Accident Zone (I2V) [1]	HLN-AZ	DENM	2	0-5,7
	Equivalent C2C use case for V2V: Stationary Vehicle Warning (Post-crash) [5]		DENM	94	3
Poor weather	HLN - Weather Condition Warning [1]	HLN-WCW	DENM	17	any
				18	any
				19	any
Poor road	HLN - Temporarily Slippery Road [1]	HLN-TSR	DENM	6	0-10
				9	0,1,4,5,7
Wrong way driver	HLN - Alert Wrong Way Driver [1]	HLN-AWWD	DENM	14	2
Amber + Blue lights	HLN - Emergency or Rescue/Recovery Vehicle in Intervention [1]	HLN-ERVI	DENM	15	0,1
	HLN - Emergency or Prioritised Vehicle Approaching [1]	HLN-EPVA	DENM	95	1,2
Traffic jam	HLN - Traffic Jam Ahead (I2V) [1]	HLN-TJA	DENM	27	0
				1	5
	Equivalent C2C use case for V2V: Traffic condition [6]		DENM	1	0

Abbreviations: RWW = Road Works Warning (Service), HLN = Hazardous Location Notification (Service)

Sending

Sending by a vehicle

Euro NCAP Local Hazards [8]	C-ROADS Use Case	Message profile requirements	Message	Cause Code	Subcause Code
Construction zones	PVD-Vehicle Data Collection [1] (Scenario: Construction zone and road works location validation)	MSP/BSP[3], CAM data elements speed and heading shall be used	CAM	-	-
Items on road	PVD-Event Data Collection [1]	DENMs need to be in line with HLN - Object on the Road (except stationType)	DENM	10	0-5
Stopped vehicle	PVD-Event Data Collection [1]	Triggering Conditions and Data Quality Stationary Vehicle Warning[4] [5]	DENM	94	0
Broken down vehicle			DENM	94	2
Post crash			DENM	94	3
Poor weather	PVD-Event Data Collection [1]	Triggering Conditions and Data Quality Adverse Weather Conditions[4] [7]	DENM	18	1
			DENM	19	0
	PVD-Vehicle Data Collection [1] (Scenario: Poor weather condition)	MSP/BSP[3], CAM data elements fogLightOn and lowBeamHeadlightsOn shall be used	CAM	-	-
Poor road	PVD-Event Data Collection [1]	Triggering Conditions and Data Quality	DENM	6	0

		Adverse Weather Conditions[4] [7]			
Wrong way driver	PVD-Vehicle Data Collection [1] (Scenario: Wrong-way driver)	MSP/BSP[3], CAM data elements pathHistory and heading shall be used	CAM	-	-
Amber + Blue lights[1]	HLN-Emergency or Prioritised Vehicle Approaching [1]		DENM	15	0,1
	HLN-Emergency or Rescue/Recovery Vehicle in Intervention [1]		DENM	95	1,2
Traffic jam[2]	PVD-Event Data Collection [1]	Triggering Conditions and Data Quality Traffic Condition*** [6]	DENM	1	0
			DENM	27	0

Abbreviations: PVD = Probe Vehicle Data (Service), HLN = Hazardous Location Notification (Service)
[1]) restricted to special vehicles
[2]) specifications available, but not applicable for "sending" in Euro NCAP 2026
[3]) The C-ROADS message profile for CAMs [2] and general requirements in MSP [3] or BSP [4] apply.
[4]) The C-ROADS message profile for DENMs [2] applies. With respect to the triggering conditions for certain event data, these are specified in [5], [6], or [7] respectively.

References

[1] C-ROADS C-ITS Service and Use Case Definitions 2.3.0 (see releases.c-roads.eu)
[2] C-ROADS C-ITS Message Profiles 2.3.0 (see releases.c-roads.eu)
[3] C-ROADS C-ITS Infrastructure Mobile ITS-G5 System Profile 2.3.0 (see releases.c-roads.eu)
[4] CAR 2 CAR CC Vehicle C-ITS station profile, Release 1.6.8
[5] CAR 2 CAR CC Triggering Conditions and Data Quality Stationary Vehicle Warning Release 1.6.8
[6] CAR 2 CAR CC Triggering Conditions and Data Quality Traffic Condition, Release 1.6.8
[7] CAR 2 CAR CC Triggering Conditions and Data Quality Adverse Weather Conditions, Release 1.6.8
[8] Euro NCAP Safe Driving Vehicle Assistance Protocol Version 1.0 https://www.euroncap.com/media/85818/euro-ncap-protocol-safe-driving-vehicle-assistance-v10.pdf