



**CAR 2 CAR**  
COMMUNICATION CONSORTIUM

## C-ITS in Europe

Niels Peter Skov Andersen

General Manager, CAR 2 CAR Communication Consortium

10<sup>th</sup> November 2021



# Purpose and Scope of the C2C-CC

- founded in 2002 by European vehicle manufacturers
- key player with high reputation in driving C-ITS developments and assisting to achieve vision zero at the earliest possible date
- enhancing road safety and traffic efficiency by means of Cooperative Intelligent Transport Systems and Services (C-ITS)
- clear focus on tactical level
  - wireless ad-hoc short-range vehicle-to-everything communication (V2X)
  - creating standards ensuring the interoperability and seamless evolution of cooperative systems and services spanning all vehicles classes, across borders and brands
- working with European and international standardisation organisations, e.g. ETSI and CEN but also IEEE, ISO and others
- evolved into one of the key players in preparing realistic C-ITS deployment strategies and next innovation phases towards cooperative automated driving
- establishing the necessary profiling of standards

# Cooperation with C-Roads

During the European ITS Congress 2017 at Strasbourg the C2C-CC and C-Roads Platform signed a Cooperation Agreement



---

**Administration of the Memorandum of Understanding**

5. This MoU shall last until the end 2020. It may be renewed upon mutual written consent of both parties when new Rules of Procedure are adopted in either party, or when particular procedures are adopted at world-wide level. It may also be amended upon mutual written consent of both parties in the light of experience and technical developments.

Notwithstanding the foregoing, this MoU may be terminated by either party upon 90 day's written notice to the other. Upon any termination or expiration of this MoU, all the rights granted pursuant to this MoU shall cease immediately and the parties shall cease from distributing any information received pursuant to this MoU. Notwithstanding anything in this MoU or otherwise to the contrary, the provisions of this MoU related to ownership of rights shall survive any termination or expiration of this MoU.

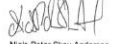
Any difficulties arising shall be agreed wherever possible at the working level between the relevant Group Chairmen. Matters which cannot be resolved at working level shall be subject to discussion between the two organisations at the level of the General Manager of the CAR 2 CAR Communication Consortium and the C-Roads Platform chairperson of the Steering Committee.

The MoU shall not be deemed or construed to be modified, amended or waived, in whole or in part, except by written agreement of both parties. Neither party may assign this MoU or any of its rights, obligations or duties hereunder, without the prior written consent of the other party.

The relationship between the CAR 2 CAR Communication Consortium and the C-Roads Platform shall be that of independent signatories, and nothing in this MoU shall be construed to constitute either party as an employee, agent or member of the other party. Without limiting the foregoing, neither party shall have authority to act for or to bind the other party in any way, to make representations or warranties or to execute agreements on behalf of the other party, or to represent that it is in any way responsible for the acts or omissions of the other party.

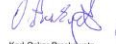
6. The practical contacts and decisions for the application of this MoU will be taken by the General Manager of the CAR 2 CAR Communication Consortium and the Chairperson of the C-Roads Platform Steering Committee.

Dated: 20/07/17




Niels Peter Skov Andersen  
General Manager  
CAR 2 CAR Communication Consortium

Dated: 20/07/17




Karl-Dieter Proskawetz  
Administrator

Dated: 20/07/17



Eric Ollinger  
Chairperson

Dated: 20/07/17



Martin Böhm  
General Secretary  
Signed on behalf of the C-Roads Platform

---

MoU between C2C-CC and C-Roads Platform
3
June 2017



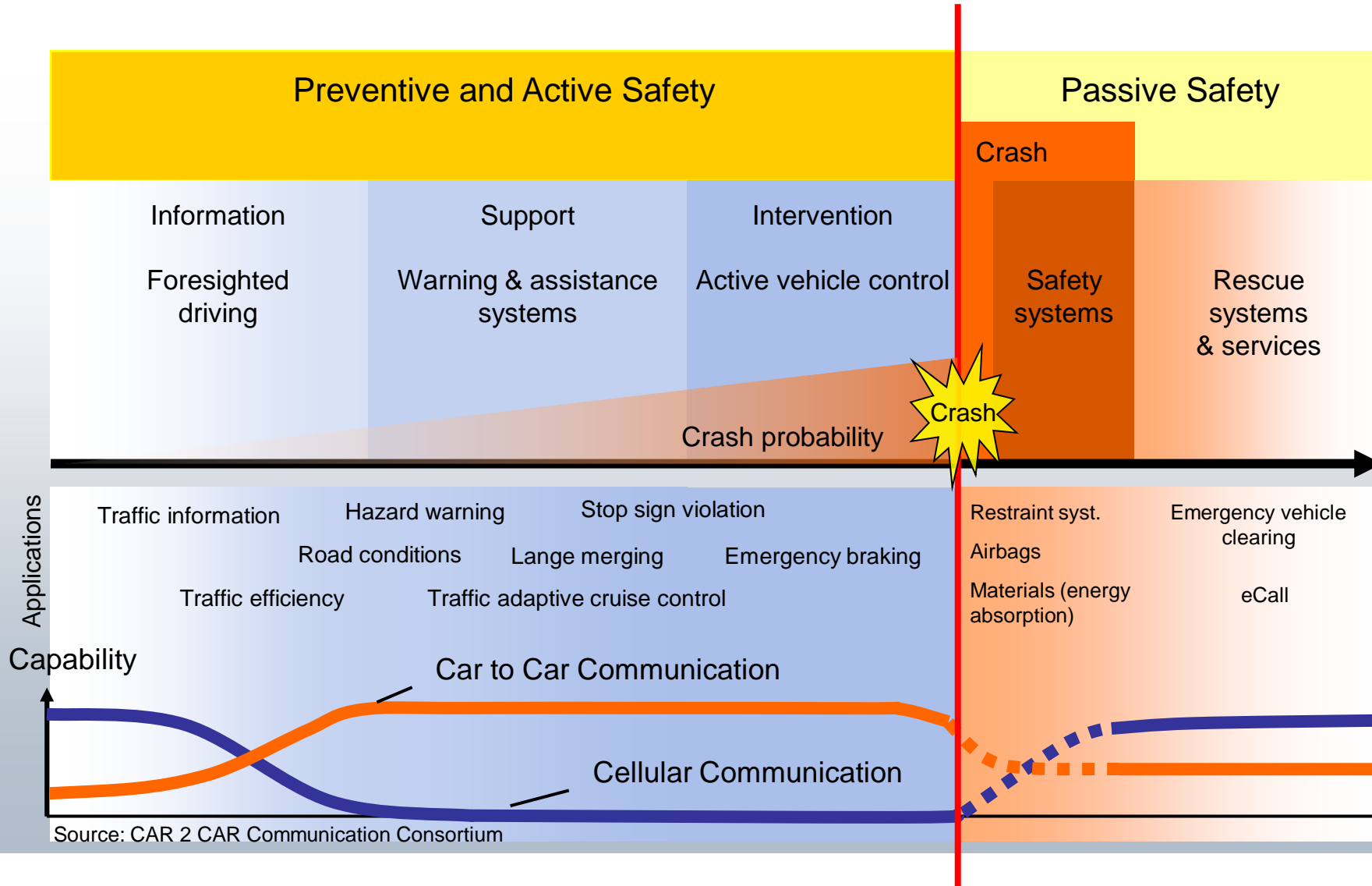
# Key elements for the successful deployment of C-ITS

- Engaging with stakeholder about the ideas of cooperative road traffic, outstanding issues and road maps to C-ITS deployment
- close coordination with stakeholders for definition, interpretation and use of standards and system profiles – this to ensure interoperability across borders, road operators and brands
- Interoperability testing with deployment projects
- Focus on security framework
- initial Day 1 deployment started in 2019 – the VW Golf 8 was the first vehicle there as standard was equipped with Car-to-X communication other models have followed
- ... and now definition phase of Day 2 and beyond has been initiated in 2019

# Generalised Automotive Communication Needs

- Tactical information
  - information related to proximity of vehicle, e.g. obstacles, cooperation with nearby vehicles for lane merging, C-ACC, Platooning, VRU protection, etc.
  - ad-hoc **short range**, low latency and high QoS
  - safety critical information – communication becomes part of functional safety (ISO 26262)
- Strategical information
  - information that allows planning ahead, e.g. route, maps, road conditions, traffic information etc.
  - **wide area coverage**, less constrains on latency and QoS
- Infotainment
  - other communication not directly related to the driving
  - **wide area coverage**

# Active Safety with CAR-2-CAR Communications



# Day 1 Use Case Examples

### Hidden Intersection

9/11/2021 CAR 2 CAR Communication Consortium

### Post-Crash and Break Down Warning

9/11/2021 CAR 2 CAR Communication Consortium

### Road Works Warning & Lane Change Indication

9/11/2021 CAR 2 CAR Communication Consortium

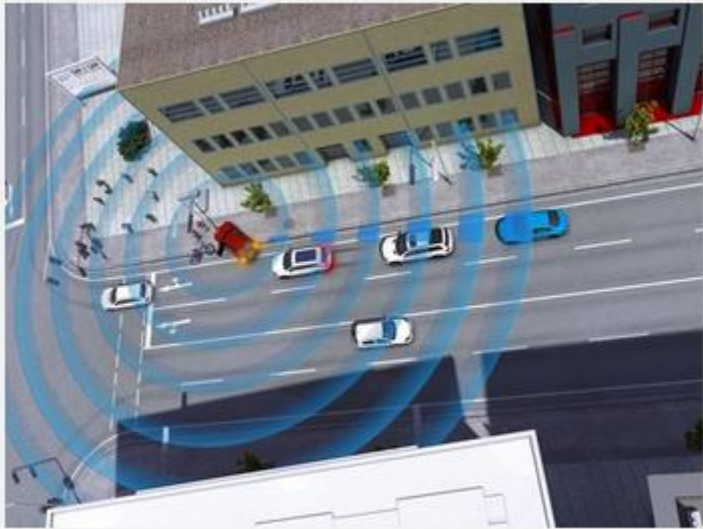
### Emergency Vehicle Warning & Prioritisation

9/11/2021 CAR 2 CAR Communication Consortium

### Traffic Jam Ahead Warning

9/11/2021 CAR 2 CAR Communication Consortium

# Phases of Cooperative driving



**Awareness Driving**



**Sensing Driving**

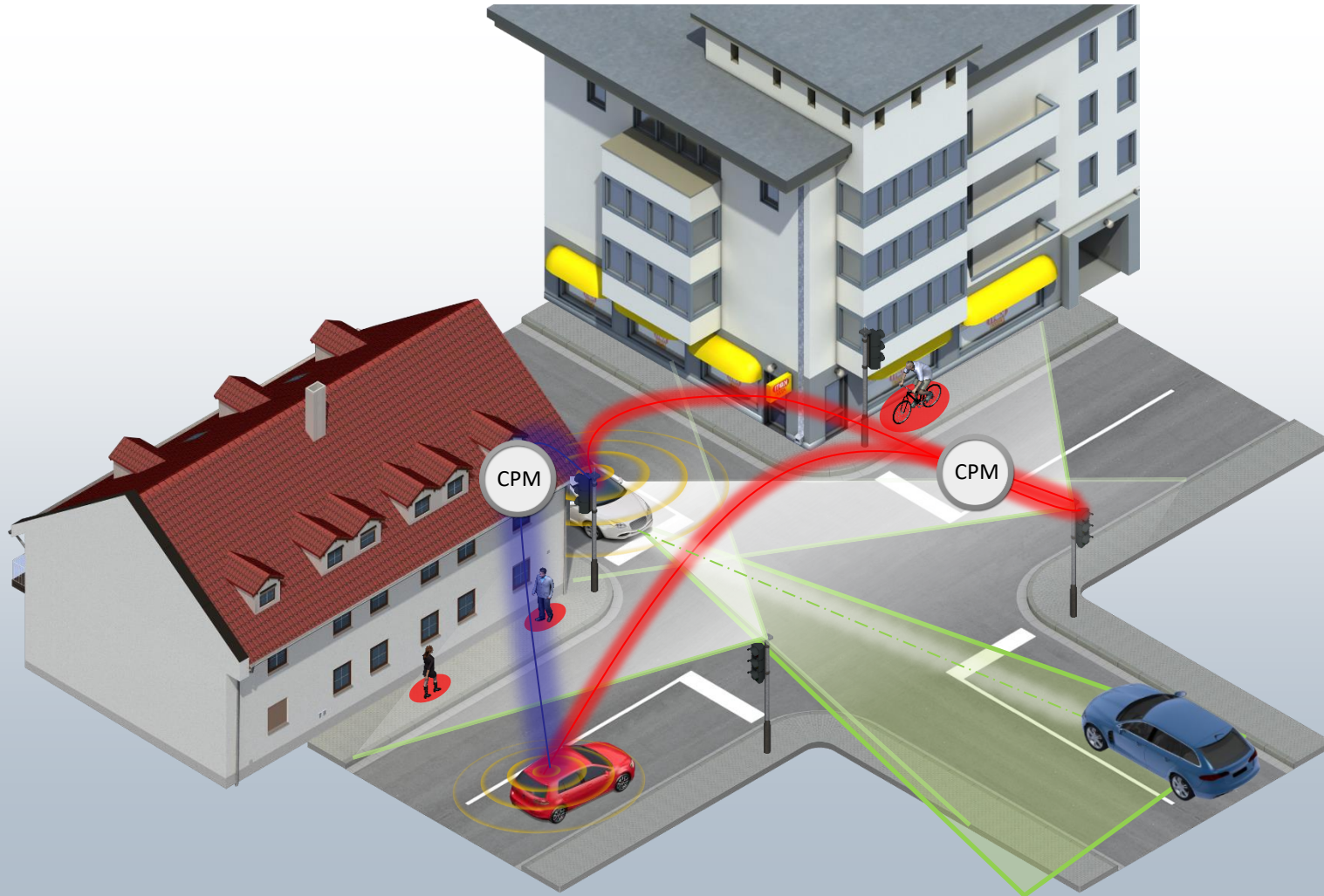


**Cooperative Driving**

Source: CAR 2 CAR Communication Consortium



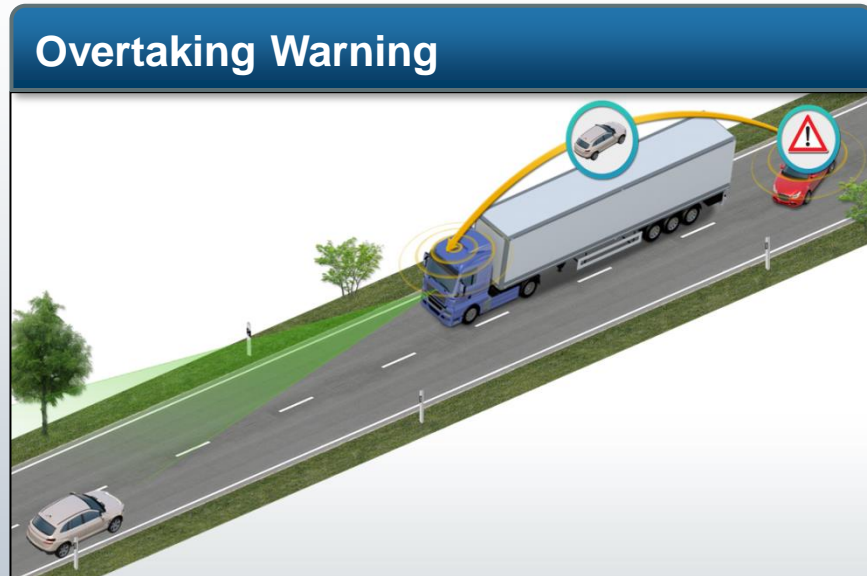
# What is Collective Perception?



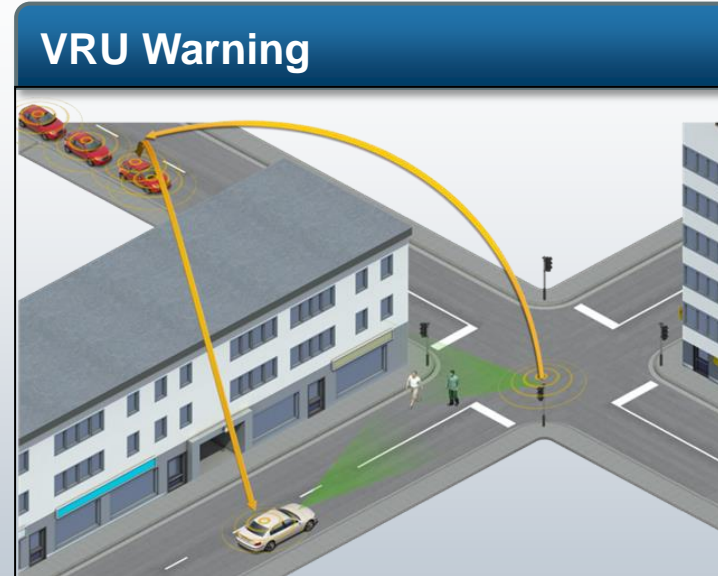
- Increase awareness by sharing information about locally detected objects
- Enables hidden line of sight applications by raising awareness also about non-connected road users (especially VRUs)
- Vehicle sensors and sensors mounted to infrastructure components can share information
- Collective Perception Service on ITS-S generates Collective Perception Message
- ETSI TR 103 562 approved by ETSI WG1, to be published by end of November 2019
- Standardization activities now focus on ETSI TS 103 324

# Day 2: Collective Perception

- Sharing abstract descriptions of objects detected by vehicle or infrastructure sensors
- Creates improved awareness even with low C-ITS penetration



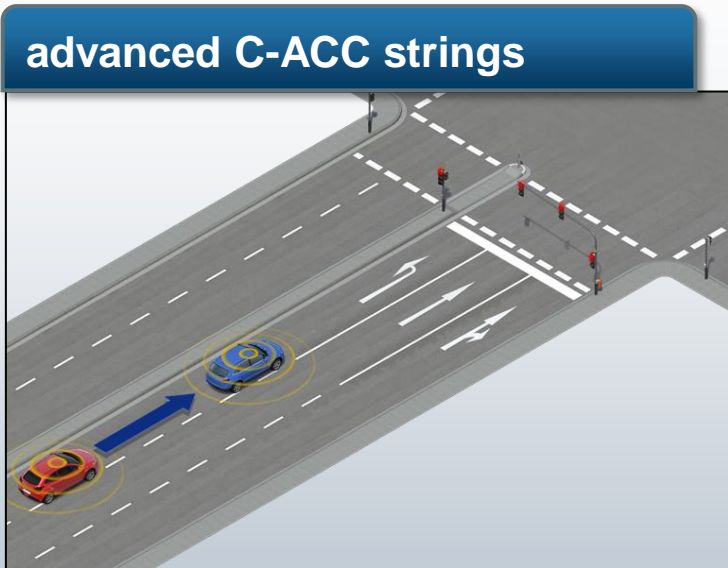
Overtaking car analyses the rx info and warn the driver if necessary



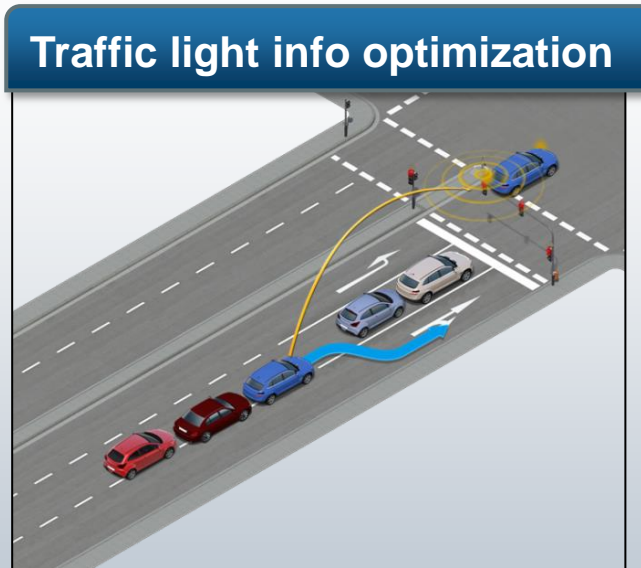
Turning car analyses the rx info and warns the driver if necessary

# Day 3/4: Trajectory / Maneuver Sharing

- Sharing automated vehicles' intended maneuvers and trajectories  
Examples (from EU H2020 MAVEN project):



Based on intended maneuver at next intersection, vehicles assess the convenience of building small strings, and keep them using exchanged trajectory for lateral control

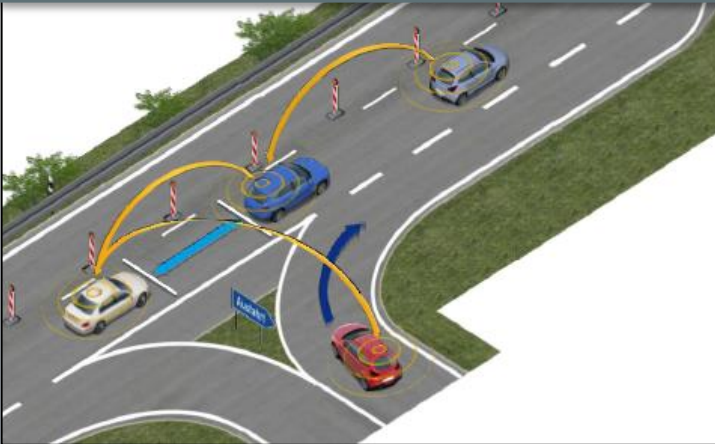


Based on rx intended maneuver at intersection, infra calculates and suggests optimisation info such as lane-specific GLOSA or lane change advices

# Day 3/4: Coordination / Negotiation Sharing

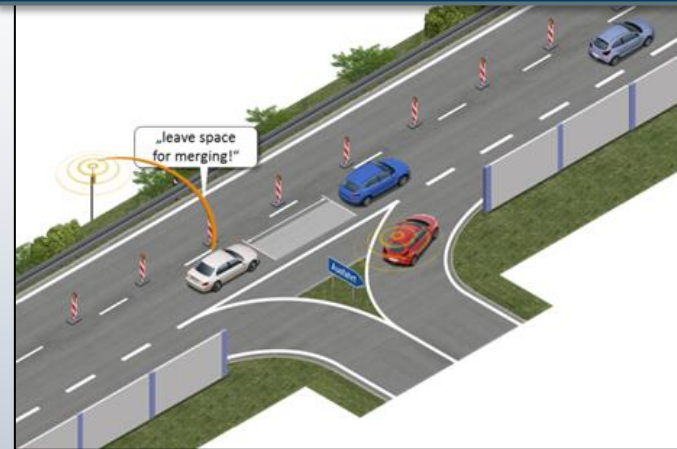
- Enabling V2V and I2V interaction for coordinated maneuver execution
- Examples (from German IMAGinE and EU H2020 TransAID projects)

## Cooperative Merging on Highways



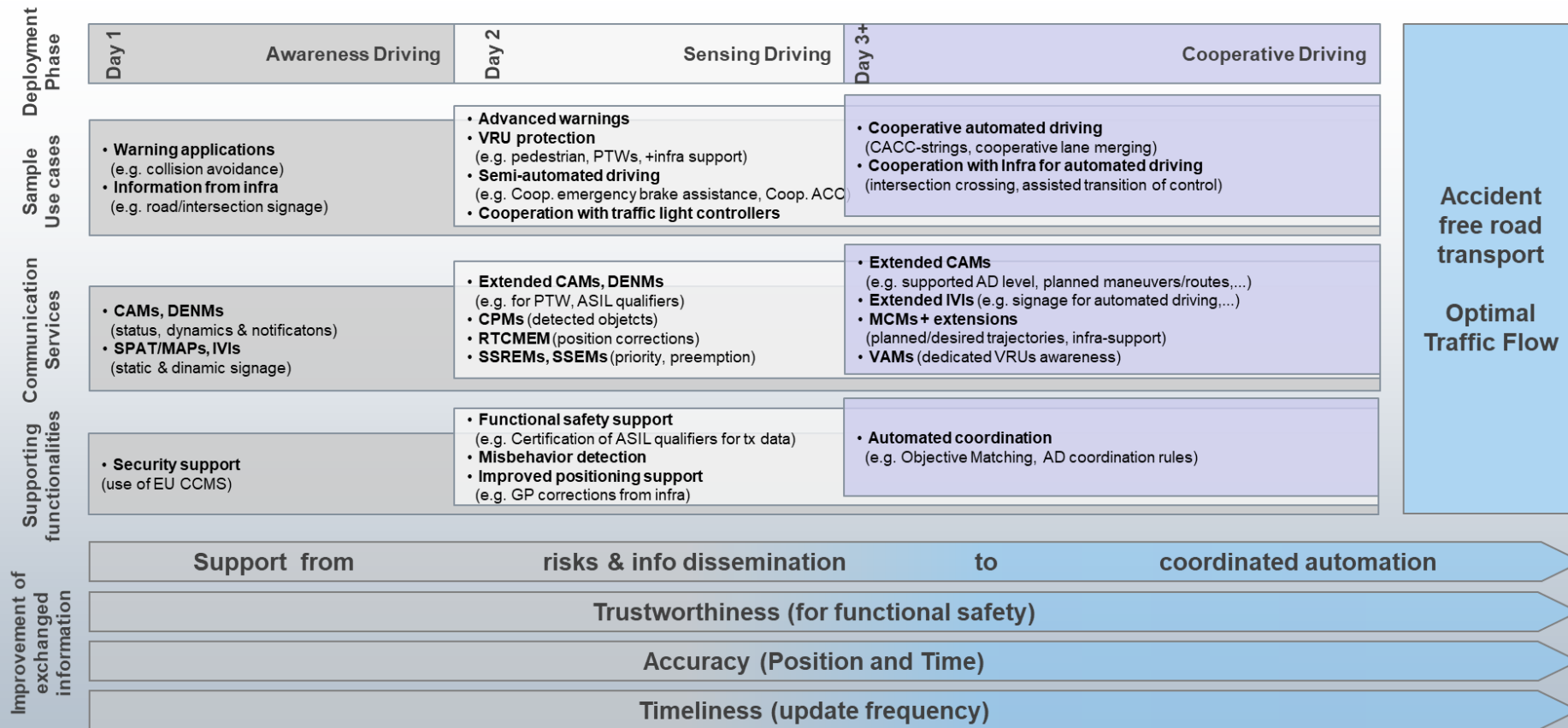
Based on notification of intended merging, interested vehicles exchange info to coordinate gap opening and merging maneuvers with increased time spans

## I2V assisted- cooperative merging



Infra suggest info to coordinate right of way in a way to optimise the overall traffic flow

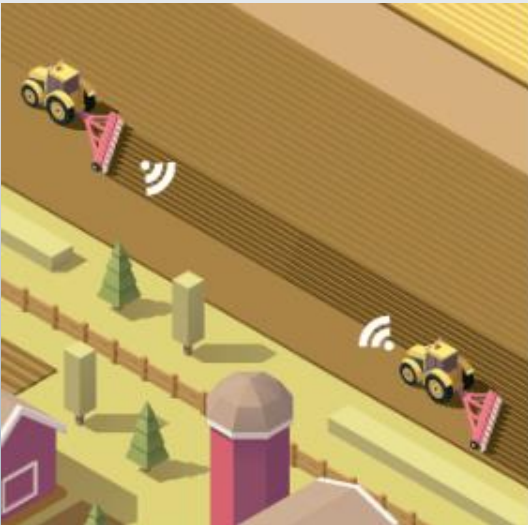
# C2C-CC Roadmap



# C-ITS beyond the road

- C-ITS is more than road safety – CAR 2 CAR Communication Consortium is engaging with other sectors to obtain synergies - one example is the agriculture domain

**Process data exchange**



**Cooperative machines Platooning**

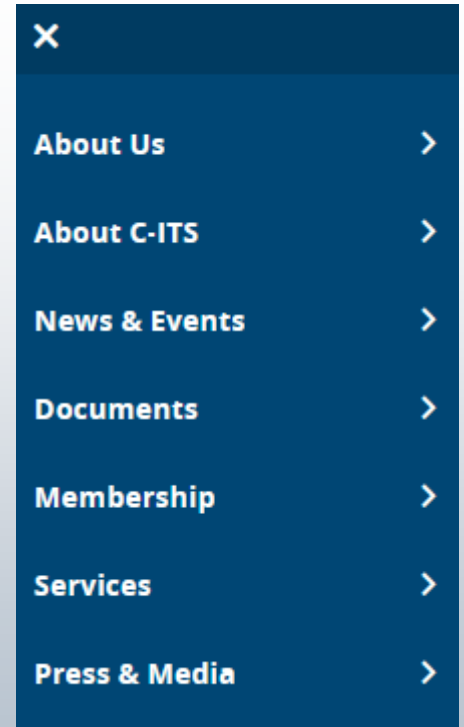


**Road safety**



# C2C-CC Documentation

- released documents are published on the C2C-CC website [www.car-2-car.org](http://www.car-2-car.org)
  - **Basic System Profile**  
<https://www.car-2-car.org/documents/basic-system-profile/>
  - **White Papers and Position Papers**  
<https://www.car-2-car.org/documents/general-documents/?L=-1>
  - **Other Documents**  
<https://www.car-2-car.org/documents/publications/>
  - **Press & Media**  
<https://www.car-2-car.org/press-media/>



# Day 1 - Basic System Profile

- Basic System Profile  
latest version 1.6.0 published in August 2021  
<https://www.car-2-car.org/documents/basic-system-profile/>

## Basic System Profile

Release 1.6.0

The image displays five document covers for the CAR 2 CAR Basic System Profile Release 1.6.0. Each cover is blue and white and features the CAR 2 CAR logo. The covers are titled as follows:

- Triggering Conditions and Data Quality Adverse Weather Conditions
- Triggering Conditions and Data Quality Dangerous Situation
- Triggering Conditions and Data Quality Exchange of IRCs
- Triggering Conditions and Data Quality Special Vehicle Warning
- Triggering Conditions and Data Quality Stationary Vehicle Warning

Each cover also includes the text "About the DSX-CC" and "Disclaimer". The date "July 2021" is printed at the bottom of each cover.



Contact:

Niels Peter Skov Andersen  
npa@anemonetechnology.com

