Future applications for V2X in Europe

Andras Varadi, representing the Car2Car Communication Consortium

The big picture

Awareness Driving → Sensing Driving → Cooperative Driving

Source: CAR 2 CAR Communication Consortium
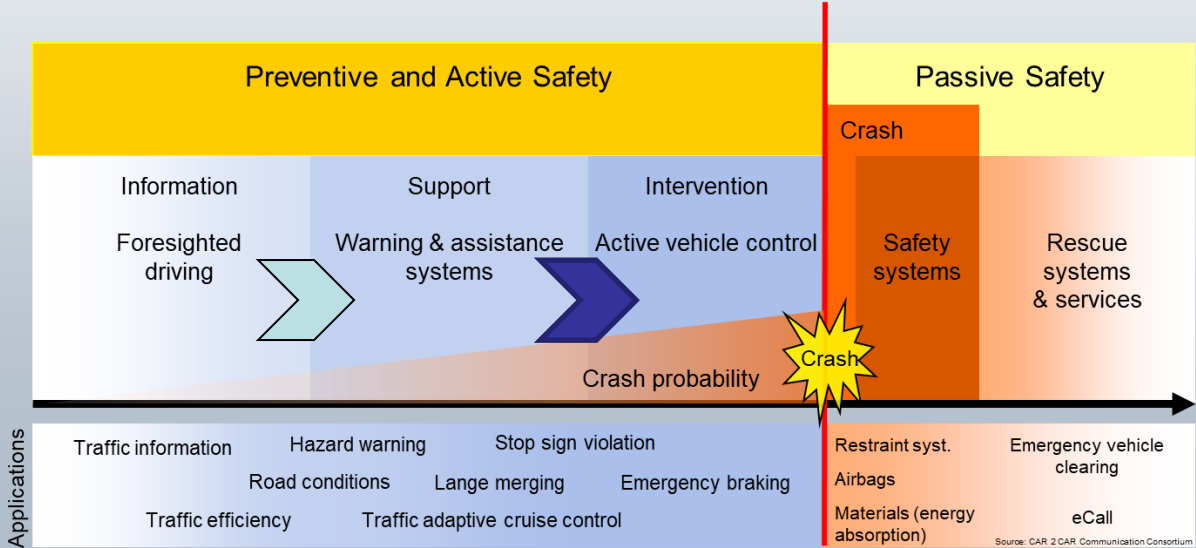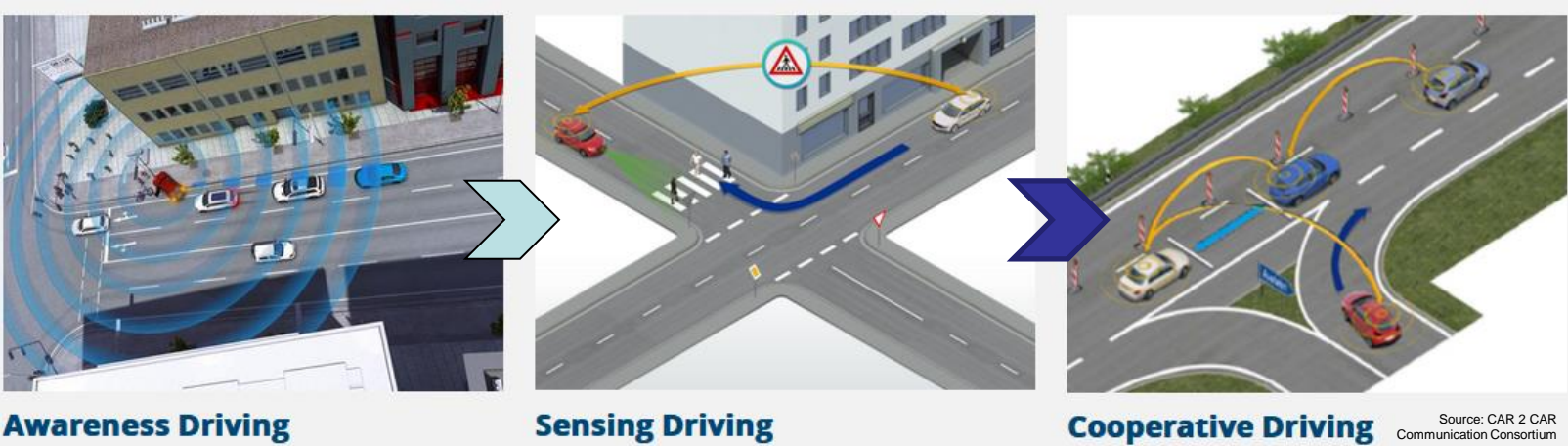
Beyond Day 1 …

- Vehicle communication and automation: an example of synergy

| ABS, ESP, ... | Forward collision W, Blind spot detection, ... | Automated reactions (e.g. braking), maneuvering (e.g. Overtaking), ... |

Automation

| | improved | improved | |
| Vehicle state monitoring | Environmental perception | Reaction/ maneuver execution/ planning | Maneuver coordination |

Communication

| Warnings about situations detected by other cars' state sensors | Automated reactions or maneuvering based on cooperative context awareness | Cooperative maneuvering (Automated merging, intersection crossing, platooning, ...) |

Warnings about situations detected by perception sensors of other cars/infra

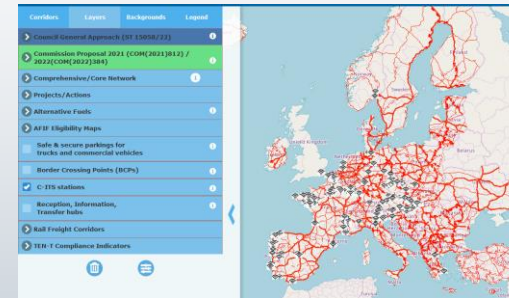CAR 2 CAR COMMUNICATION CONSORTIUM

Future: problems to solve…

- Increase benefits, lower risks and entry cost
  - Right balance of safety and convenience services
  - Long term investment requires certainty

- ADAS/AD continous ODD:
  is V2X the low hanging fruit?
  - Connectivity is a must
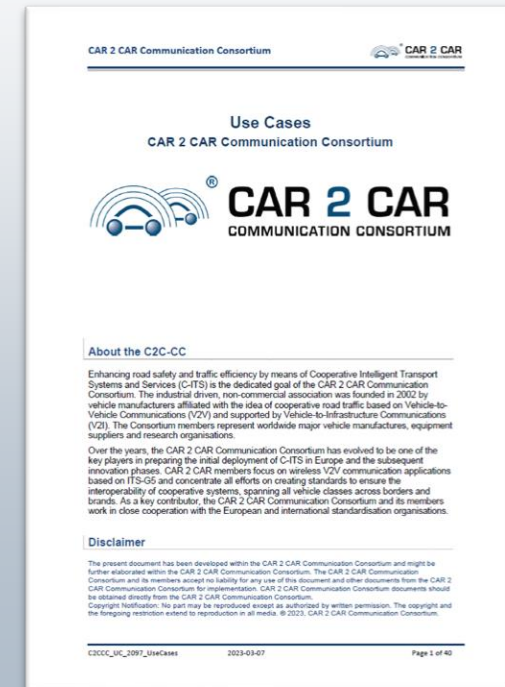

Functional Roadmap – Phased Approach
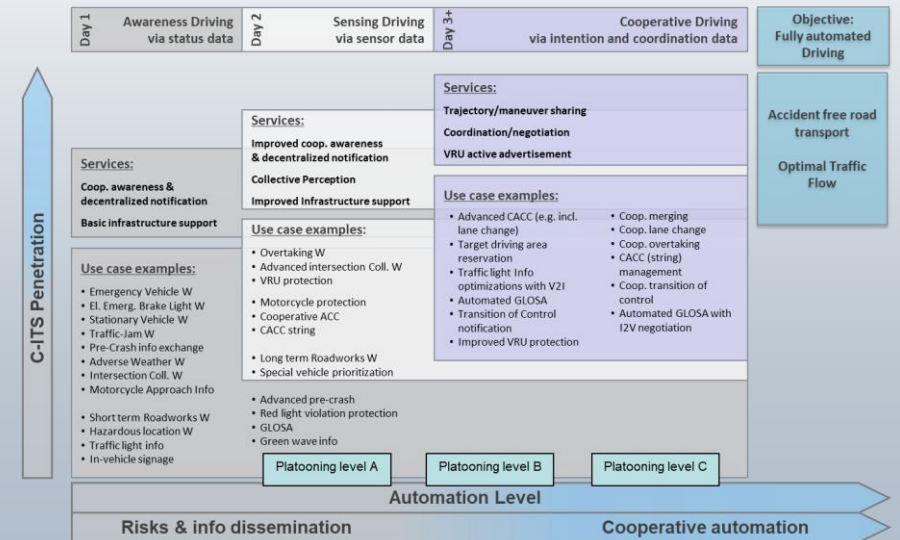
The European building blocks of C-ITS

- Introduction of new cooperative services, design of cooperative product/serive specifications
  - Basic System Profile 2.0 for Day2+ services
- Harmonize Automotive and Infrastructure
  - Roadmap
  - Services
  - Specifications and compliance
  - Regulatory environment
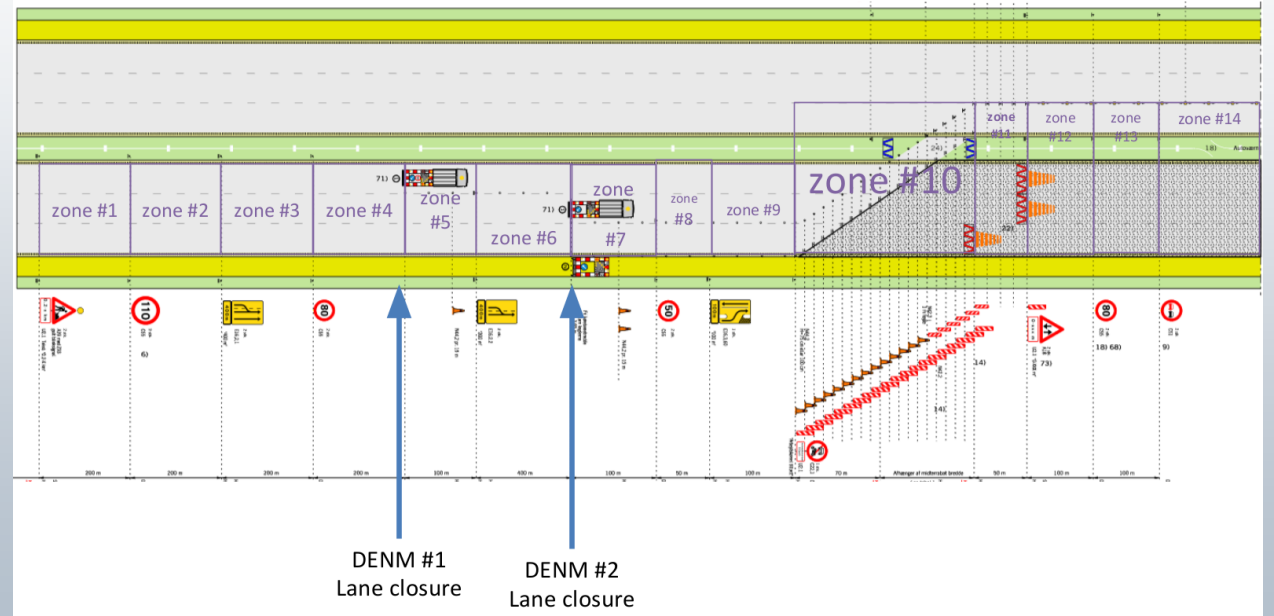
Recently published „Day2 Use Cases and beyond"
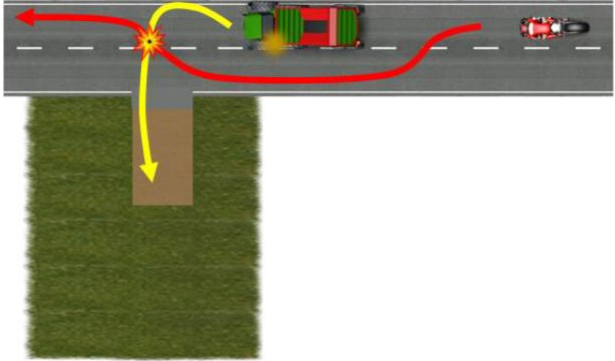
The European building blocks of C-ITS

Assembling an EWZ - example

DENM #1
Lane closure

DENM #2
Lane closure

zone #1 zone #2 zone #3 zone #4 zone #5 zone #6 zone #7 zone #8 zone #9 zone #10 zone #11 zone #12 zone #13 zone #14
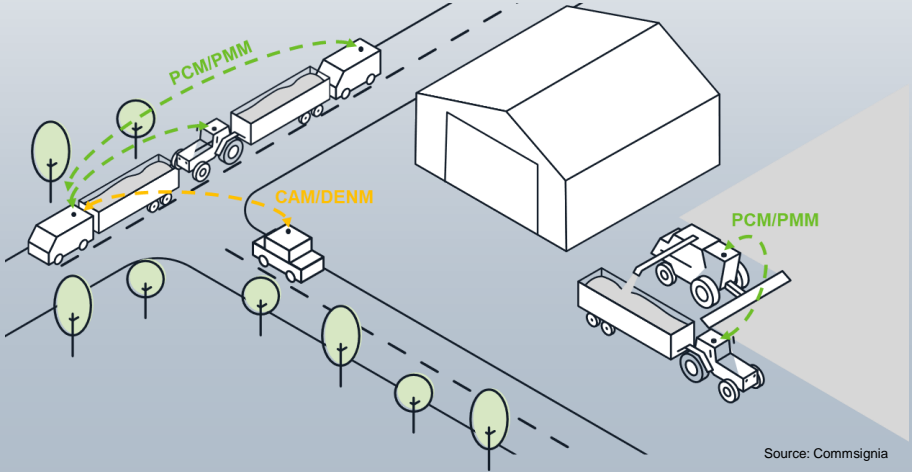
Extending the ecosystem

© This picture was created using the C2C-CC Illustration Toolkit, owned by the CAR 2 CAR Communication Consortium

Figure 19: Motorcyclist wants to overtake with a good view ahead but vehicle in front is turning left onto a field path, indicators are not visible


Source: Commsignia

VRUs, bikes, scooters

- Over 75% of cyclist road fatalities and injuries are caused by drivers and riders not seeing each other

- Market trend shifting: Safety sells

Intersection Movement Assist (IMA)
People using micromobility get a warning if it's unsafe to enter a stop-controlled or an uncontrolled intersection because of the high probability of colliding with other vehicles

Blind Spot Warning (BSW)
The app triggers an alert on the micromobility vehicle when it is trying to overtake an obstacle and another vehicle is approaching from behind in the adjacent lane.
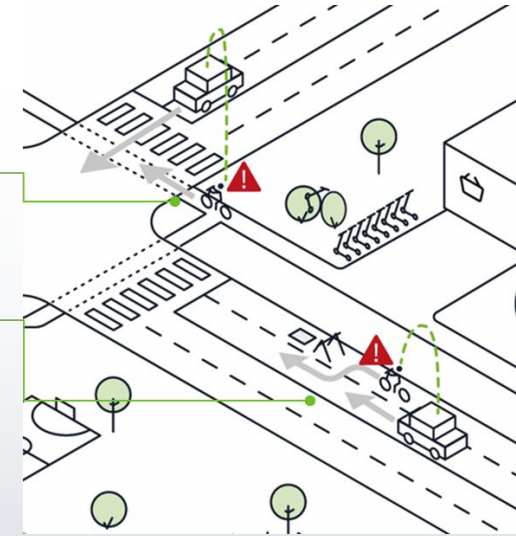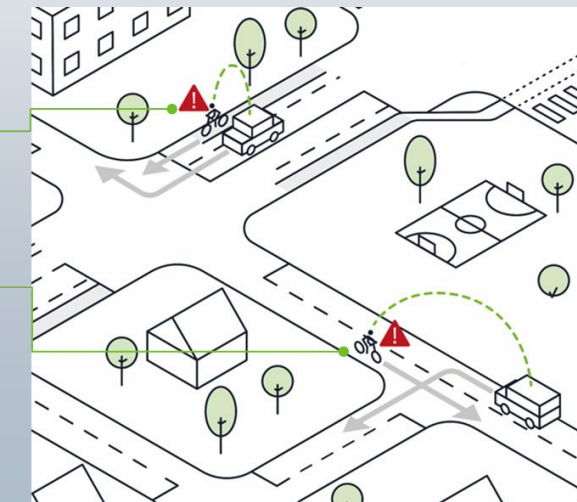
Right-turn Warning (RTW)
Micromobility riders are warned if a vehicle in the same lane and direction is about to make a sharp right turn in front of them.

Left-turn Warning (LTW)
A warning is automatically activated at an intersection if the V2X on-board unit of the micromobility vehicle detects a left-turning car crossing its estimated path
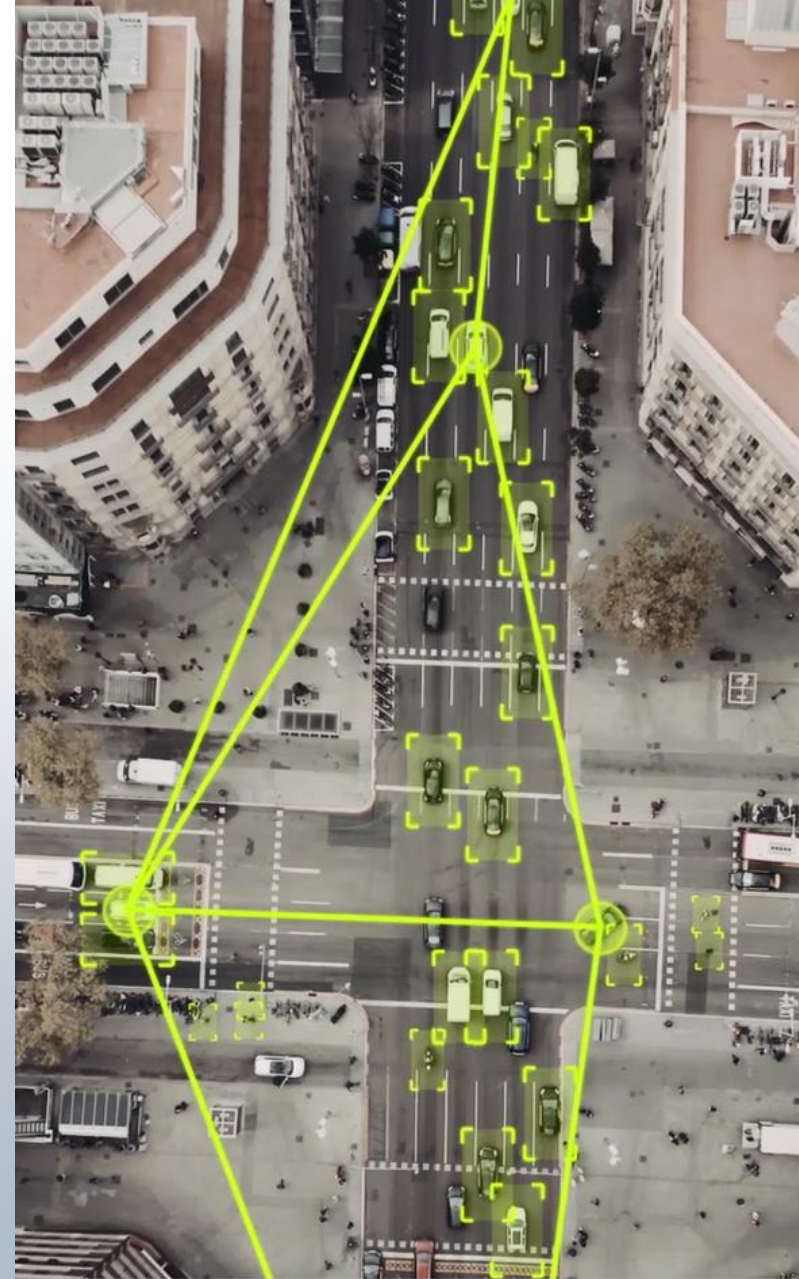
Source: Commsignia

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

Having a connected vehicle makes only sense if you have someone to connect to and the services will depend on who you can connect to.
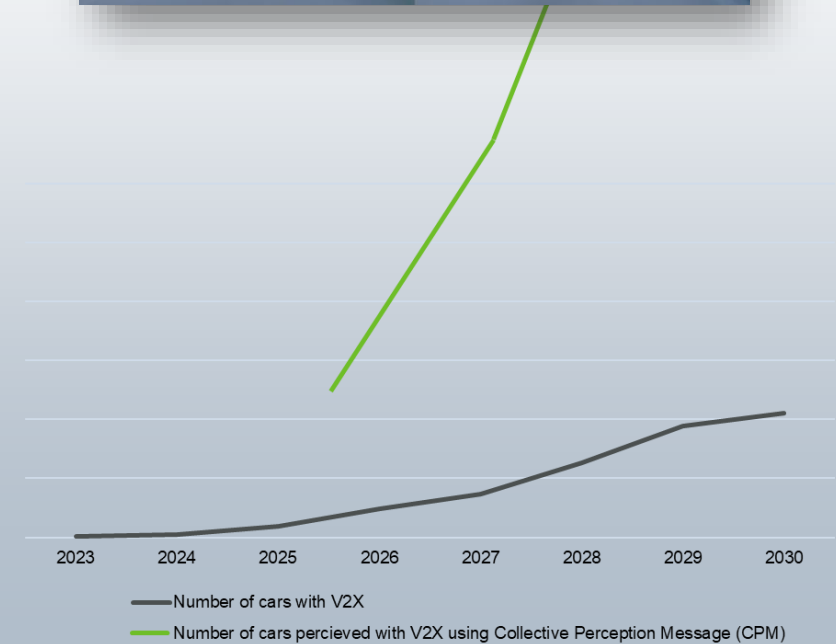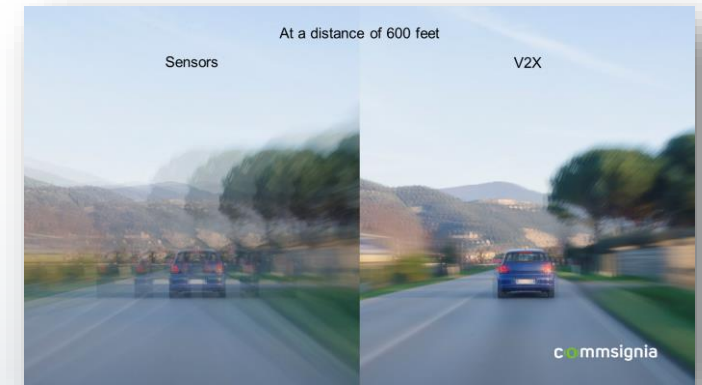
Source: Commsignia

Why coollective perception is essential

CPM can…

- Protect non-connected users, making them part of the V2X-era

- Provide more precise sensor detection at longer ranges

- Fundamentally improving safety applications by multiplying the data (seen objects)

- Create a win-win for OEMs and Smart Cities by added benefit of the others investment

At a distance of 600 feet

Sensors — V2X

commsignia

2023 2024 2025 2026 2027 2028 2029 2030

—— Number of cars with V2X

—— Number of cars percieved with V2X using Collective Perception Message (CPM)

Source: Commsignia

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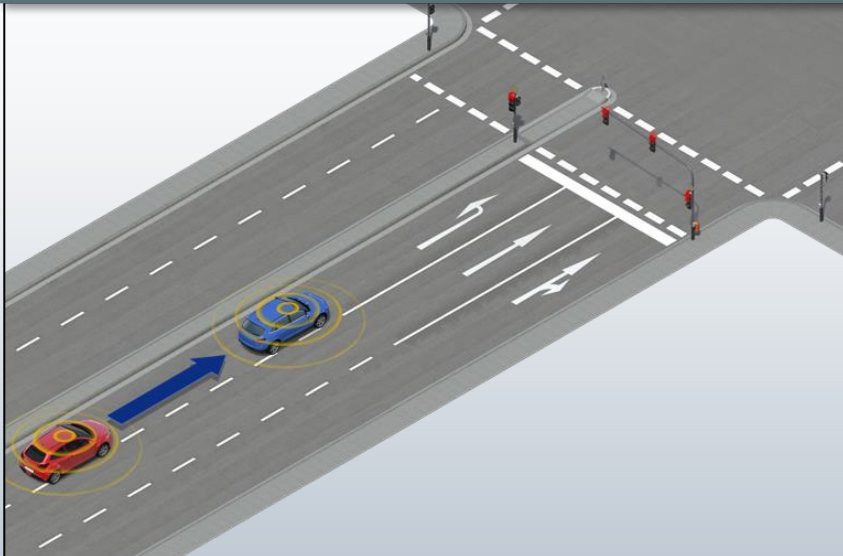
Day 3/4: Trajectory Sharing > Coordination & Negotiation

- Manouvre coordination: V2X will grow to be more then just the smartest sensor onboard

advanced C-ACC strings

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

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

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Thank You