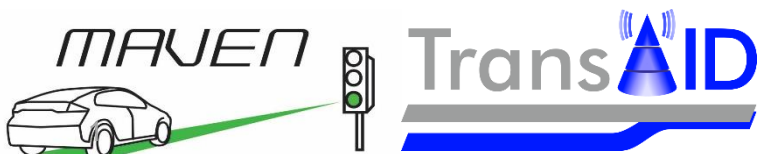# I2V applications for cooperative automated driving and traffic management

Dr. Jaap Vreeswijk
MAP traffic management, the Netherlands

Interactive Symposium on Research & Innovation for Connected and Automated Driving in Europe, 19th April 2018, Vienna
*Session: Physical and Digital Road Infrastructure*

Role of digital infrastructure in MG3.6a-2015 and ART05- 2016

… actively interacting with their intelligent environment … highly automated vehicles will have to be managed … road infrastructure will play a major role … electronic signalling and optical guidance … timely reaction … real-time warnings and information, traffic management plans, etc.

A form of traffic management and control to:

✓ Safeguard societal 'system' interests

✓ Setting constraints and rules

✓ Intervene in case of oversaturated conditions
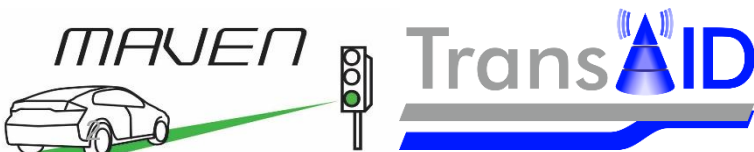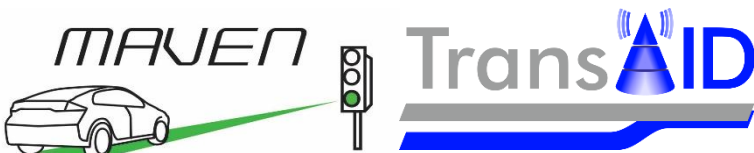
Projects overview

- **MAVEN (MG3.6a)**

  - ✓ Managing Automated Vehicles Enhances Network
  - ✓ 01-09-2016 ~ 31-08-2019
  - ✓ Budget: EUR 3.149.661,25
  - ✓ Nine partners from five countries: DE, NL, CZ, BE, UK

- **TransAID (ART-05)**

  - ✓ Transition Areas for Infrastructure-Assisted Driving
  - ✓ 01-09-2017 ~ 31-08-2019
  - ✓ Budget: EUR 3.836.353,75
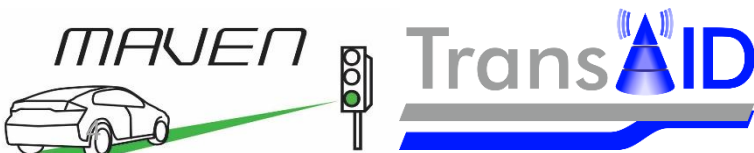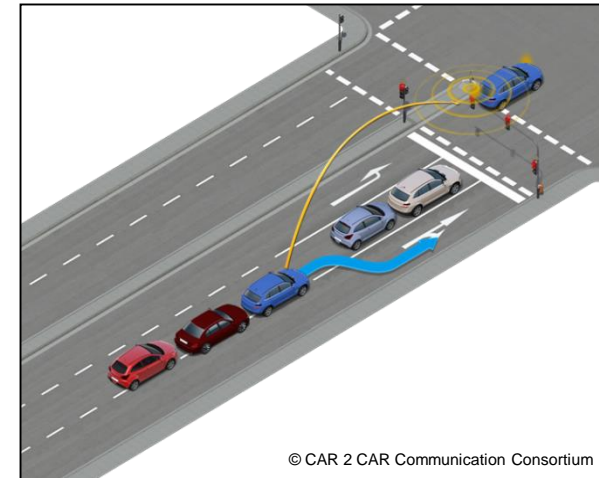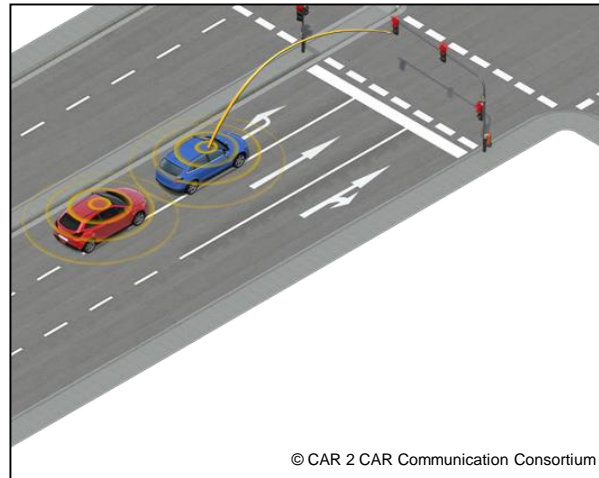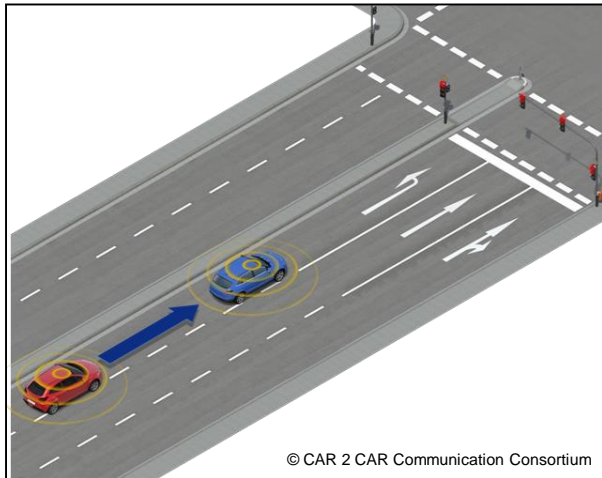 - ✓ Seven partners from 6 countries: DE, UK, BE, NL, EL, ES

MAVEN use cases [1/2]

1. **Platoon management**

   ✓ Forming, joining, progression, leaving, breaking a platoon

2. **Infrastructure-to-vehicle interactions**

   ✓ Negotiation (signal timing vs. arrival pattern), speed advisory, lane advisory

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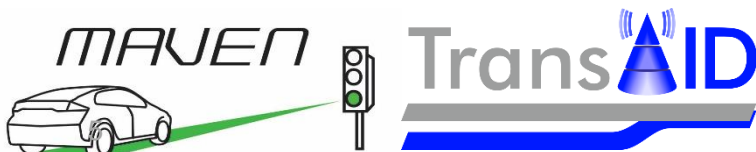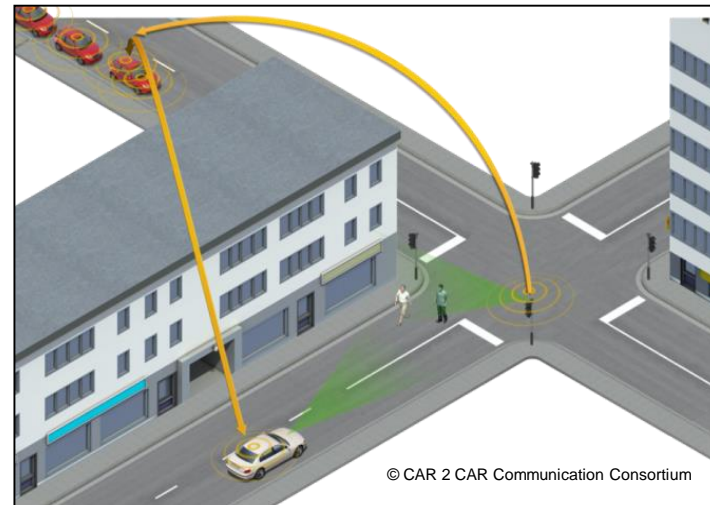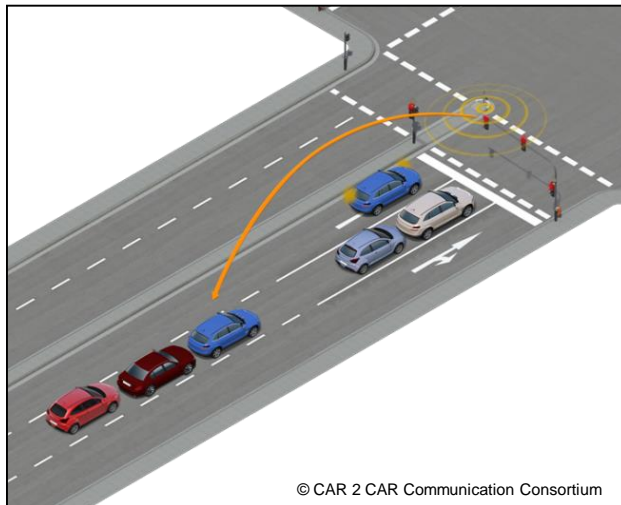
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MAVEN use cases [2/2]

3. **Traffic control optimization (and scheduling)**

    ✓ Signal optimization, priority management, queue estimation, green wave

4. **Conventional traffic and vulnerable road users**

   ✓ Detection of non-cooperative vehicles, VRUs, emergency situations

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A broader context: Transition of Control Areas

❑ …what if your automated vehicle is not able to solve the situation ahead?

    ✓ …what, if this happens not to single vehicles only, but to several?

    ✓ …what, if it always happens on the same spot?

❑ TransAID aims to:

    ✓ Help to identify potential risks

    ✓ Recommend solutions

    ✓ Coordinate movements
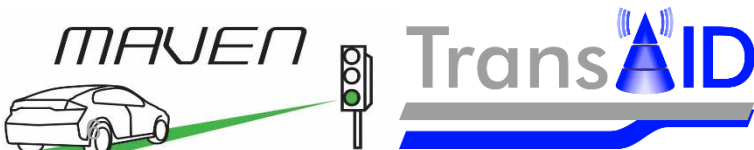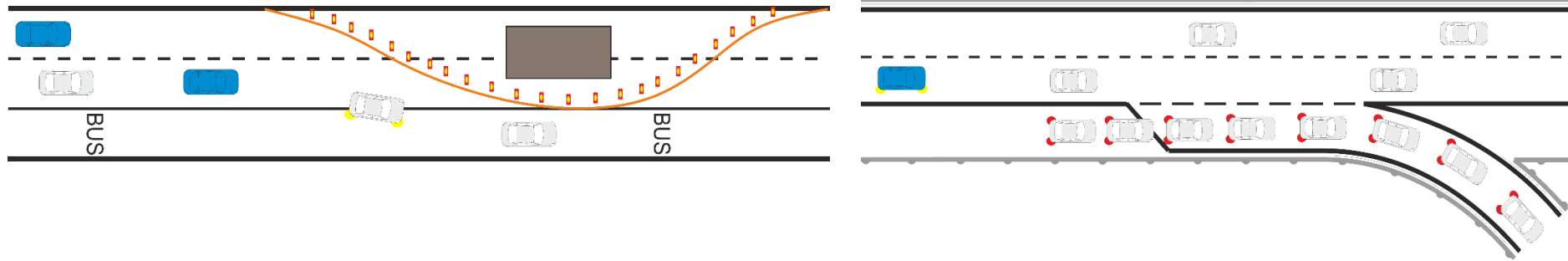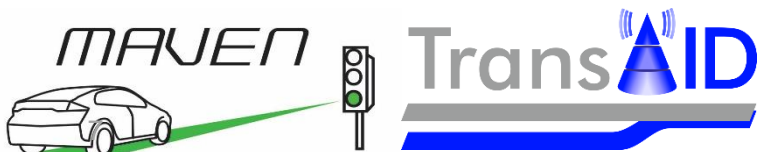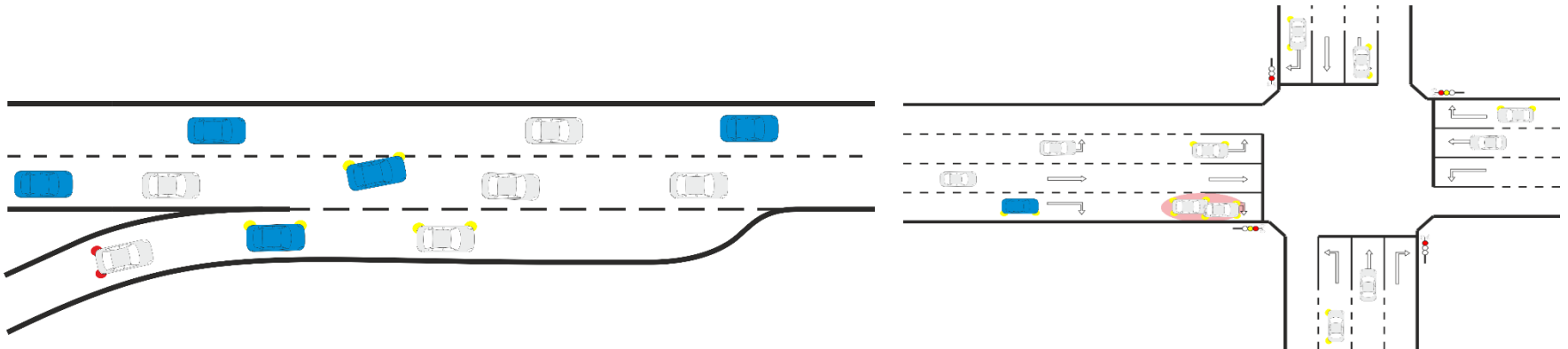
TransAID use cases (1/3)

1. Prevent ToC/MRM by providing vehicle path information

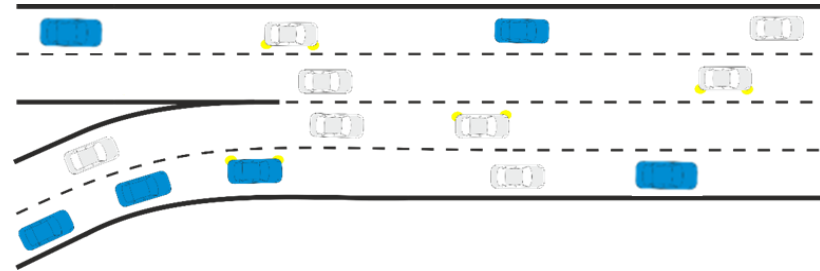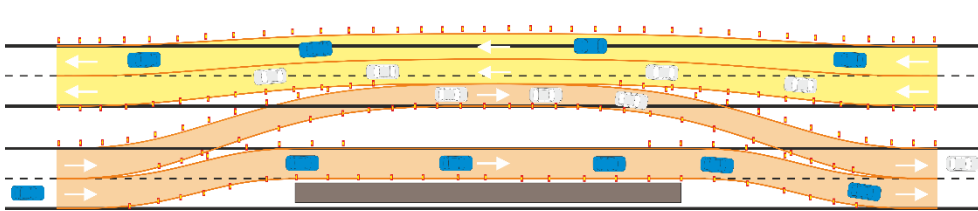2. Prevent ToC/MRM by providing speed, headway and/or lane advice

TransAID use cases (2/3)

3. Prevent ToC/MRM by traffic separation

4. Manage by guidance to safe spot
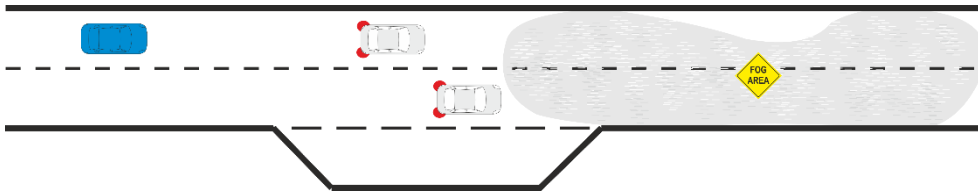
TransAID use cases (2/3)

5. Distribute ToC/MRM by scheduling ToCs
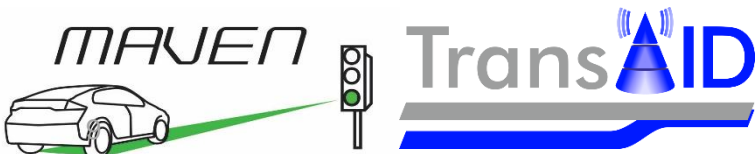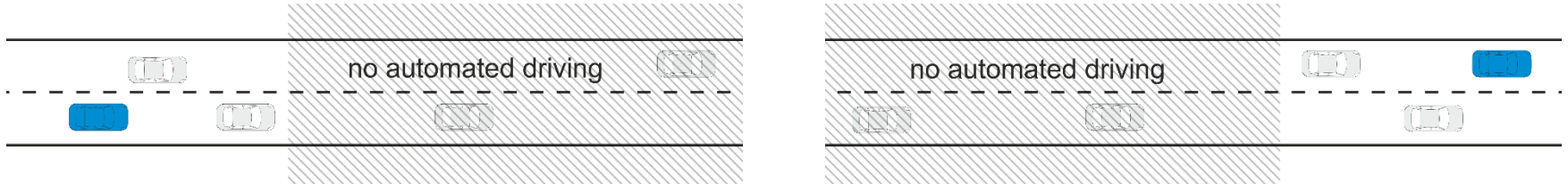
Examples V2X extensions

❑ **V2I – Cooperative Awareness Message**

   ✓   Vehicle route at intersection (intention);

   ✓   Platoon properties (size, length, roles, speed, headway, composition, etc.);

   ✓   Acknowledgments of compliance to lane changes and speed advisory (negotiation).

❑ **I2V – Lane Advice Message**

   ✓   Suggests the lane a vehicle or platoon should change to at an intersection;

   ✓   Indicates target lane, distance to stop line, and time for starting the manoeuvre;

   ✓   Combined with lane-specific Green Light Optimal Speed Advisory (GLOSA).

❑ **V2X – Collective Perception**

   ✓   Sharing abstract descriptions of objects detected by vehicle or infrastructure sensors;

   ✓   Created improved awareness even with low market penetration.
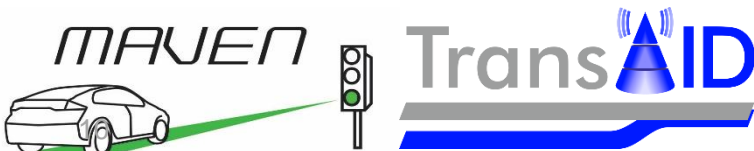
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