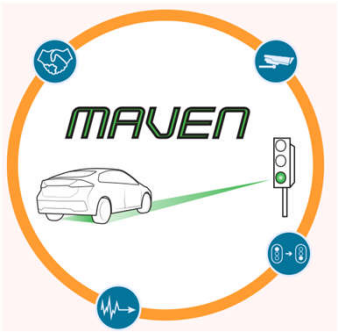

(Managing Automated Vehicles Enhances Network)

Concepts and developments for infrastructure-assisted automated driving

Michele Rondinone
Hyundai Motor Europe Technical Center GmbH, Germany

HYUNDAI
MOTOR GROUP

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690727

13th ITS EUROPEAN CONGRESS
FULFILLING ITS PROMISES
Brainport Eindhoven, the Netherlands | 3-6 June 2019

General Information

- **Duration**
  - ✓ 36 months (Sept ’16 – Aug ‘19)
- **Funding**
  - ✓ ~3M€ under EC H2020 programme
- **Partners:**
  - ✓ From five countries: DE, NL, CZ, BE, UK

DLR · dynniq · HYUNDAI MOTOR GROUP · MAP TRAFFIC MANAGEMENT · TOMTOM · CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE · POLIS · Gemeente Helmond · ROYAL borough of GREENWICH

- **Website**
  - ✓ www.maven-its.eu

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Project Summary

Assumption

- Road infrastructure applications will still play a key role in future cooperative automated driving era

Main objective

- Increasing traffic efficiency and safety in urban areas by exploiting automated driving

Approach

- C-ITS infrastructure-based traffic management solutions for cooperative automated vehicles (CAVs) at signalized intersections (traffic lights) and intersection corridors
- V2X-based automated driving extensions for perception and planning
- Use of simulation verification as well as road experiments with CAV and infra prototypes (ETSI ITS G5-based)

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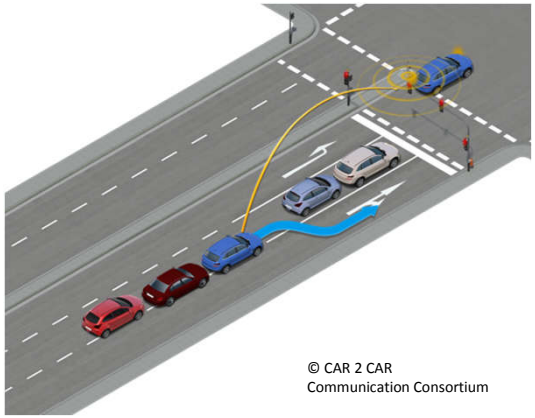
Use Cases Overview



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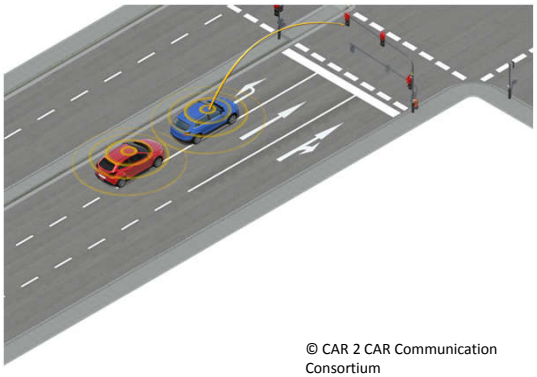
- I2V interactions
- Traffic controllers optimization



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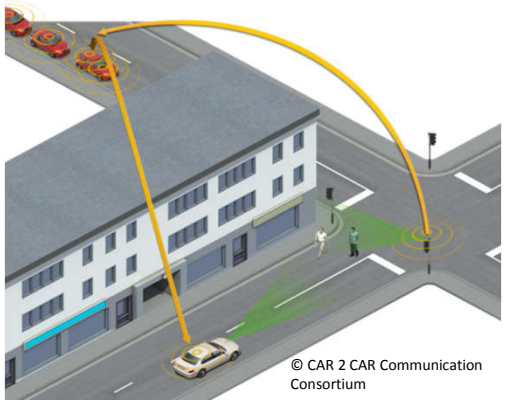
- Platoon management



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- Inclusion of conventional traffic and VRUs

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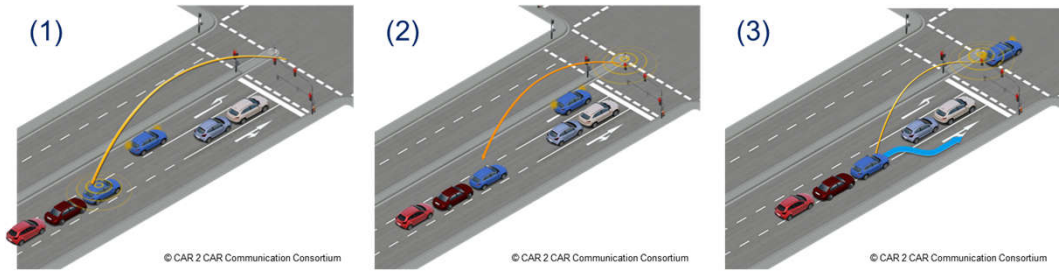
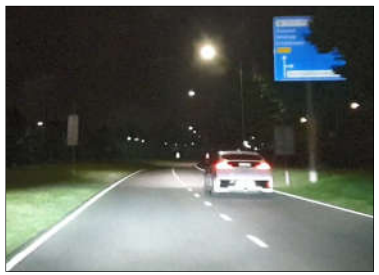
MAVEN I2V interactions



- At vehicles, V2I explicit traffic probing via transmission of maneuver/speed intentions (1)
- At traffic light controller, signal timing re-optimization and generation of speed and lane change I2V advices (2)
- At vehicles, transmission of V2I feedbacks on compliance to advisories (3)

Hyundai + Dynniq real road verification @ Helmond test site



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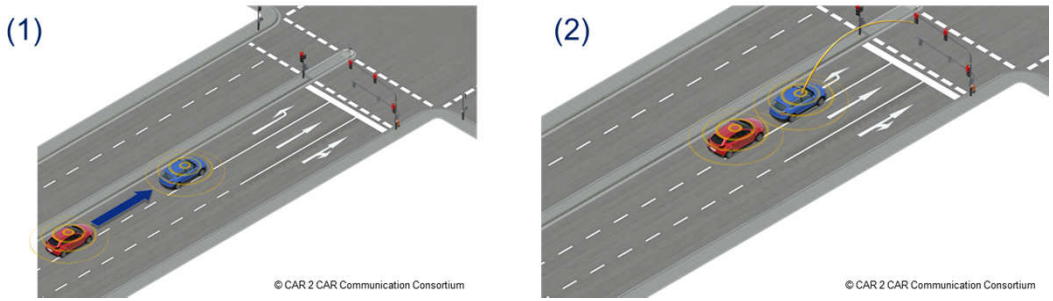
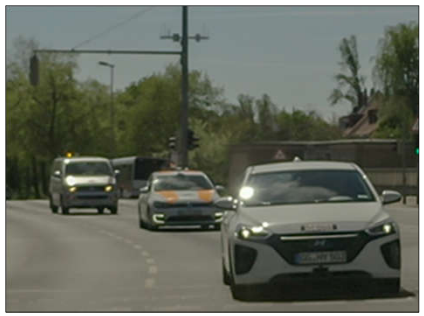
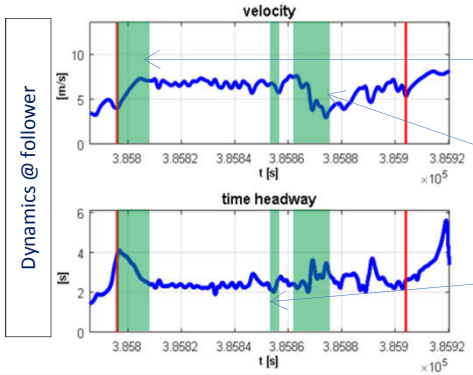
MAVEN platooning



- Distributed C-ACC algorithm based on V2V (1) to manage platoons (forming, leaving, breaking-up, terminating)
- Yet, platoon leader interacts with infra (2) which in turn can influence platoon operation with its advices

Hyundai + DLR real road verification @ Braunschweig test site





Platoon forming : inter-vehicle gap decreases as follower speeds up

Reaction to GLOSA: follower slows down as the leader

Platoon break-up: inter-vehicle gap increases because of inter-vehicles object detected by follower

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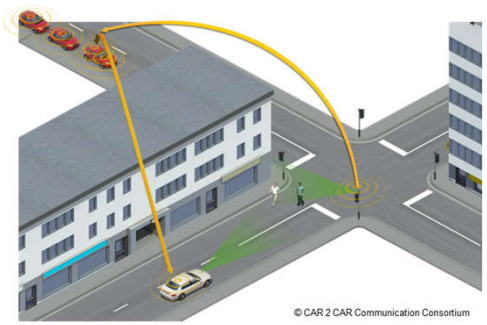
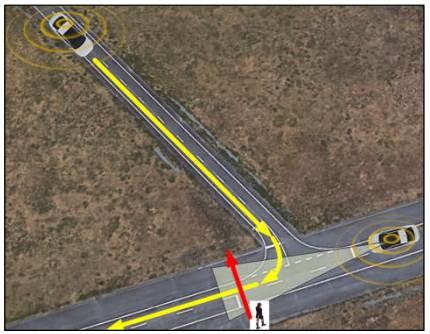
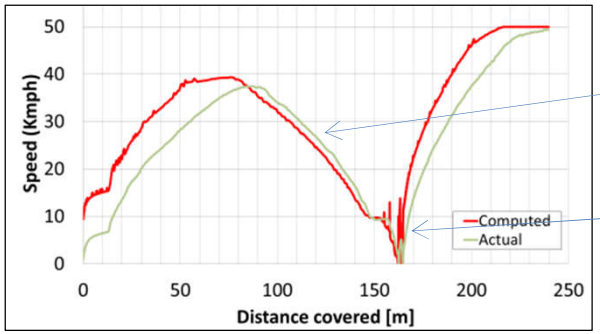
Inclusion of conventional traffic and VRUs



- Use of collective perception at both vehicles and infrastructure for improved detection and reaction
- Improved awareness used to adapt automated vehicles' maneuver/path planning for increased safety
- Nevertheless, automated vehicles keep monitoring the environment and control the system all the time to possibly undertake emergency (automated) reactions

Hyundai
Test track
verification





Car knows about VRU (via V2X),
smoothly slows down while turning

Car detects VRU in time with own sensors,
brakes and prevents collision,
speeds up again after VRUs crosses

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For additional insights on MAVEN results, join the:

MAVEN final event @ the ITS EU congress

June 6 2019, Automotive Campus, Helmond (from 10:00 to 15:00)

Registration at: https://www.polisnetwork.eu/maven-final-event-6-june-2019

Thank you!

Questions?

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