MAVEN

(Managing Automated Vehicles Enhances Network)

www.maven-its.eu

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MAVEN is funded by the EC Horizon 2020 Research and Innovation Framework Programme, under Grant Agreement No. 690727

European Commission

General information of MAVEN

- Project period
  - ✓ 01-09-2016 ~ 31-08-2019
- Funded by EC Horizon2020 Research & Innovation Programme
  - ✓ Budget: EUR 3,149,661.25
  - ✓ Nine partners from five countries: NL, DE, BE, UK, CZ
- Main goal
  - ✓ Enhancing intelligent urban road transport network and cooperative systems for highly automated vehicles

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Consortium partners

dynniq energising mobility

DLR

HYUNDAI MOTOR GROUP

Gemeente Helmond

POLIS

TOMTOM

ROYAL borough of GREENWICH

CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE

MAP TRAFFIC MANAGEMENT

MAVEN

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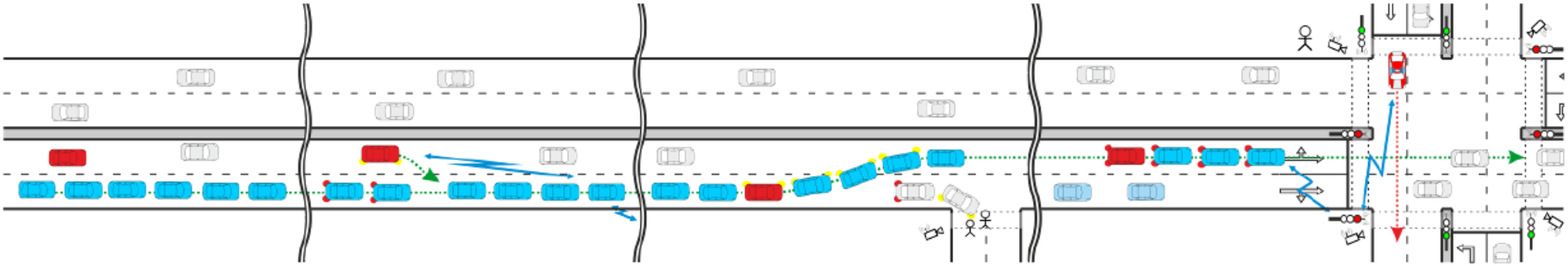
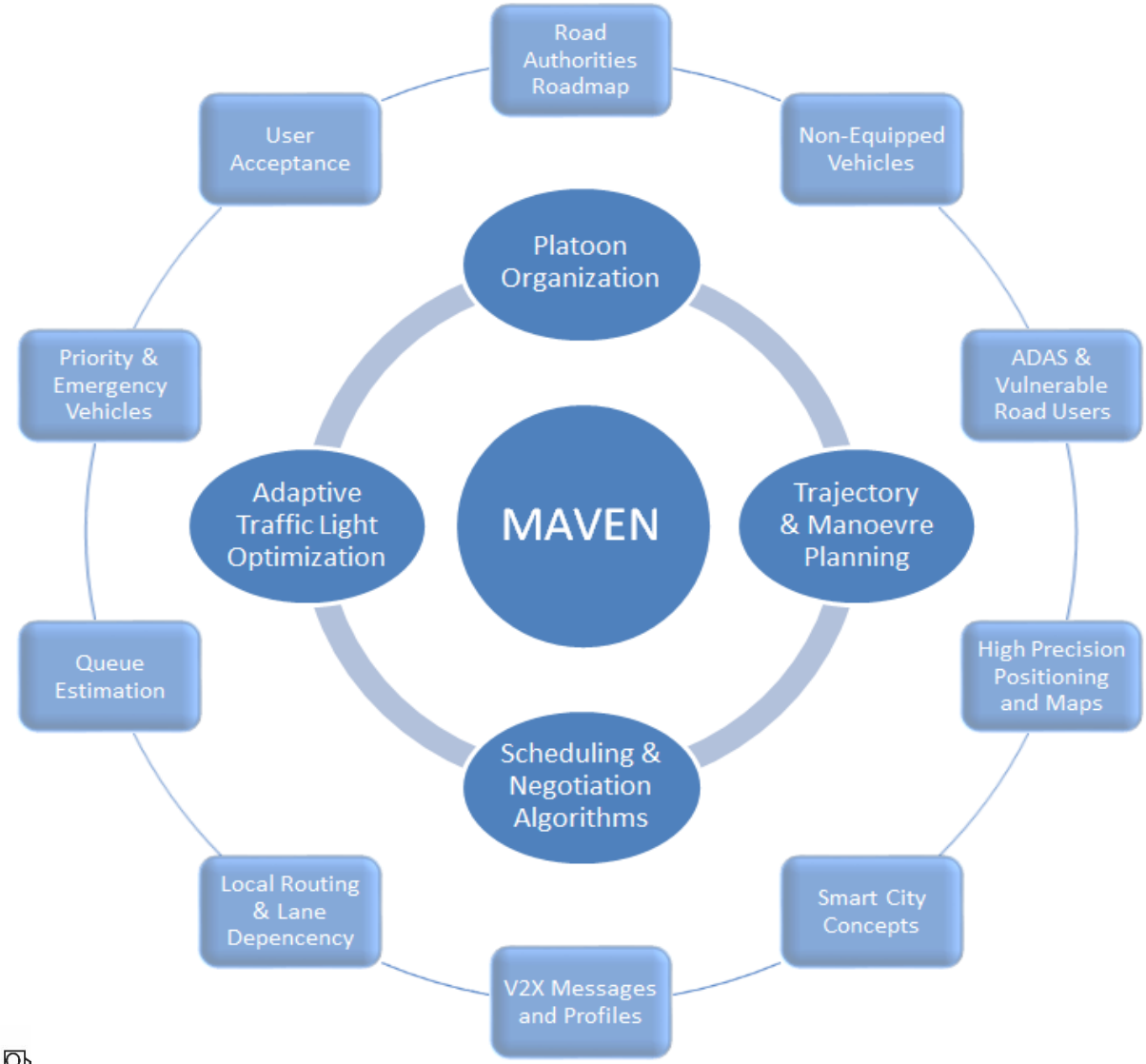
Project summary

- Main objectives
  - ✓ Management regimes for automated driving in urban areas
  - ✓ Monitoring, support and orchestration of movements of road users to guide vehicles at signalised intersections
  - ✓ Further enhancement for ADAS and C-ITS applications
- MAVEN use cases
  - ✓ VIC interactions (negotiation, speed/lane change advisory)
  - ✓ traffic controllers optimisation (signal optimisation, priority management, queue estimation, green wave)
  - ✓ platoon management (e.g. forming, joining, leaving, breaking)
  - ✓ detection of non-cooperative vehicles, VRUs, emergency situations



MAVEN concept and scope



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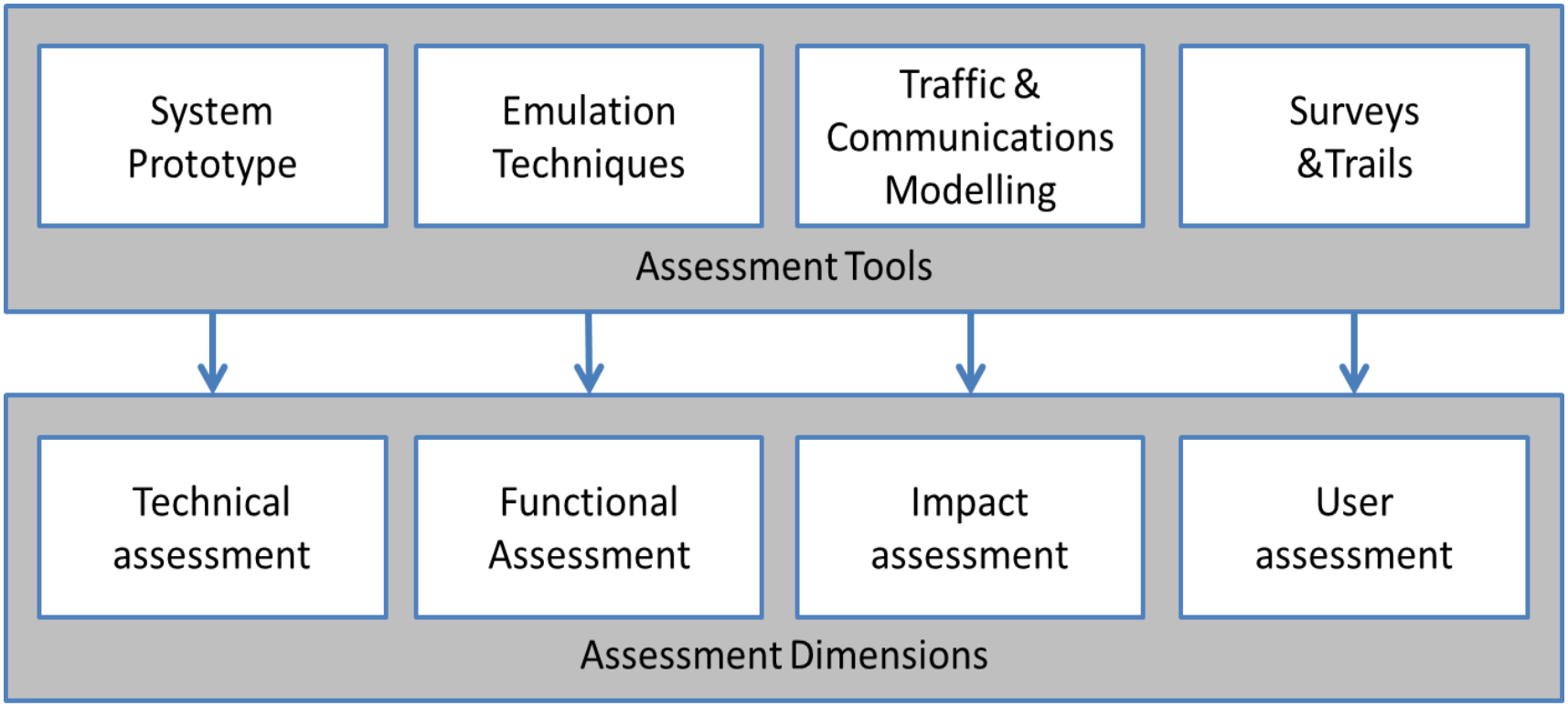
Assessment approach



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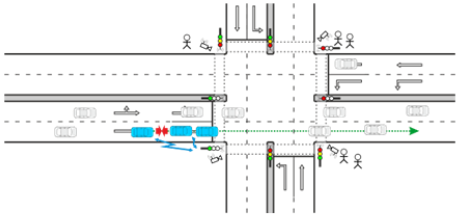
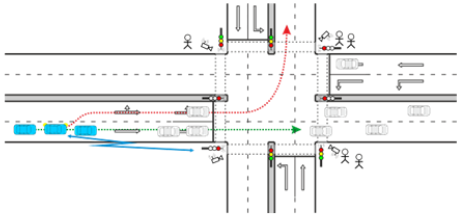
Scenarios (1/2)

- Initialization



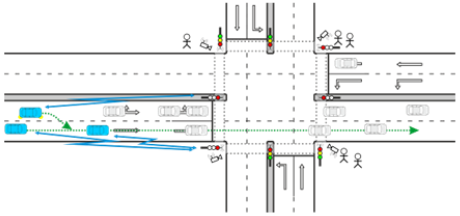
- *Ad-hoc creation*
- *Vehicle order*
- *Speed/lane change*
- *Passive I2V-initiated*
- *Active I2V-initiated*

- Leaving a platoon



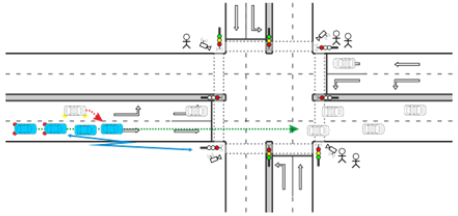
- *V2V organised*
- *Reorganisation of roles*
- *Platoon split or dissolving*

- Joining a platoon



- *I2V or V2V initiated*
- *V2V organised*
- *Speed/lane change*
- *Vehicle order*

- Break-up



- *Due to non HA vehicle*
- *Reorganisation of roles*
- *Re-negotiation behaviour*
- *New signal timing*

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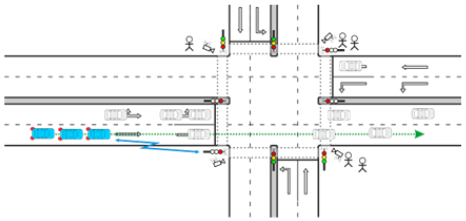
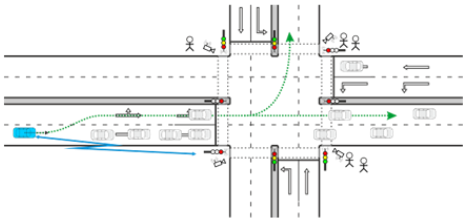
Scenarios (2/2)

- Speed changes



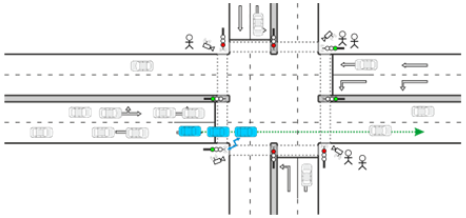
- *Prepare to stop*
- *Unexpected situations*
- *Corridor GLOSA*
- *I2V: platoon size*

- Lane changes



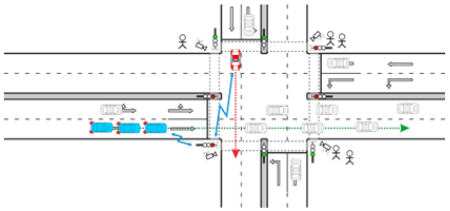
- *Lane load balancing*
- *Obstacle avoidance*
- *Local detours*

- Departure from intersection



- *Min start delay*
- *Coordinated crossing*
- *Low internal delay*

- Emergency situations



- *Make way*
- *Trajectory changes*

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MAVEN facilities

- Helmond pilot
  - ✓ offering ICT infrastructure with all major intersections equipped with cooperative RSUs; the adaptive traffic control algorithm ImFlow
- Braunschweig pilot
  - ✓ offering the latest with respect to infrastructure detection as part of the Application Platform for Intelligent Mobility (AIM) test site; stereo video detection combined with radar and hemispherical dome camera's enable the infrastructure to enhance the safety of automated driving
- Prague and Greenwich simulations
  - ✓ impact assessment of scaling up the MAVEN use cases such as platoon orchestration, Green Light optimal Speed Advice, enhanced queue modelling and green wave with platoon priority

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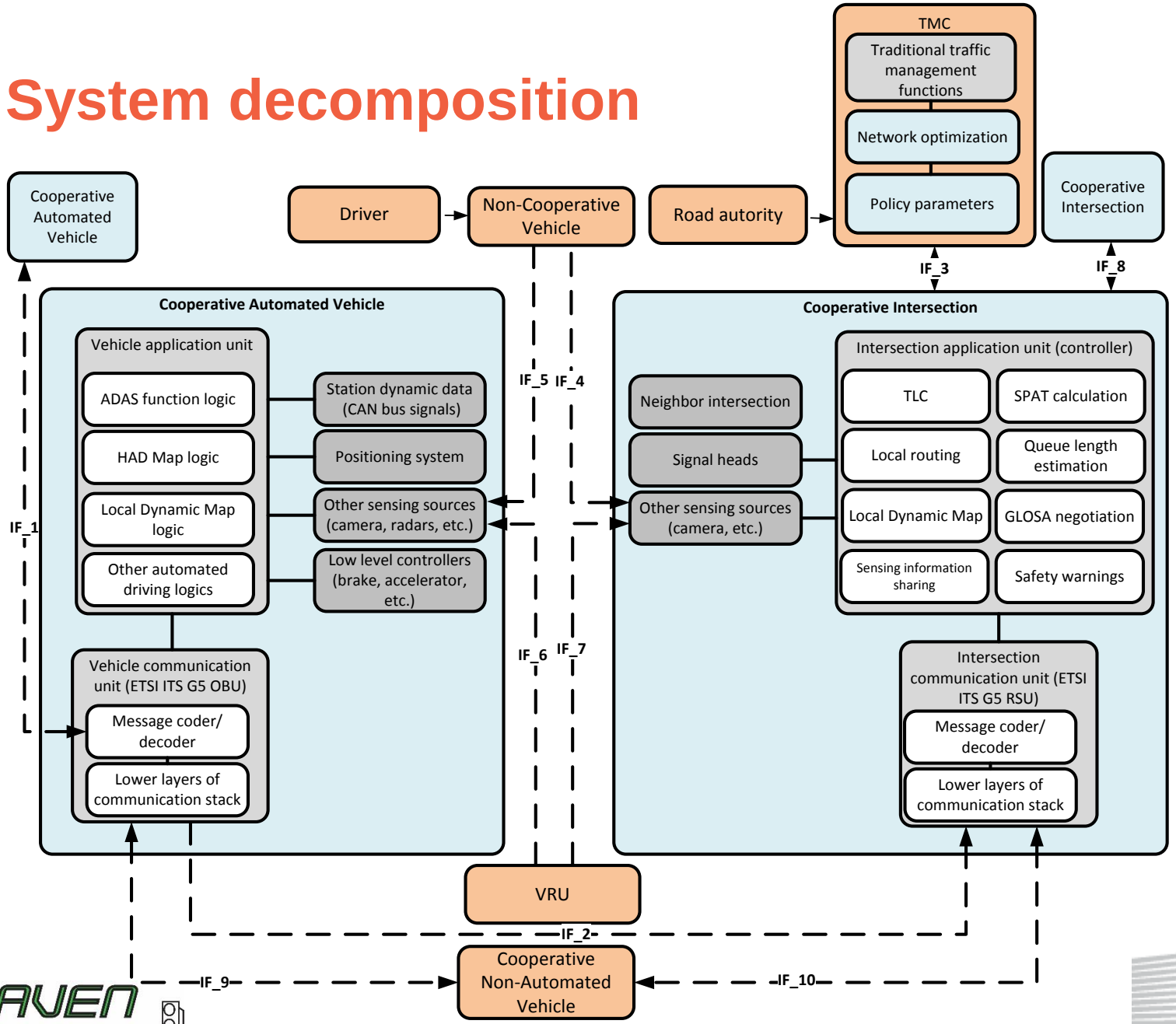
System decomposition



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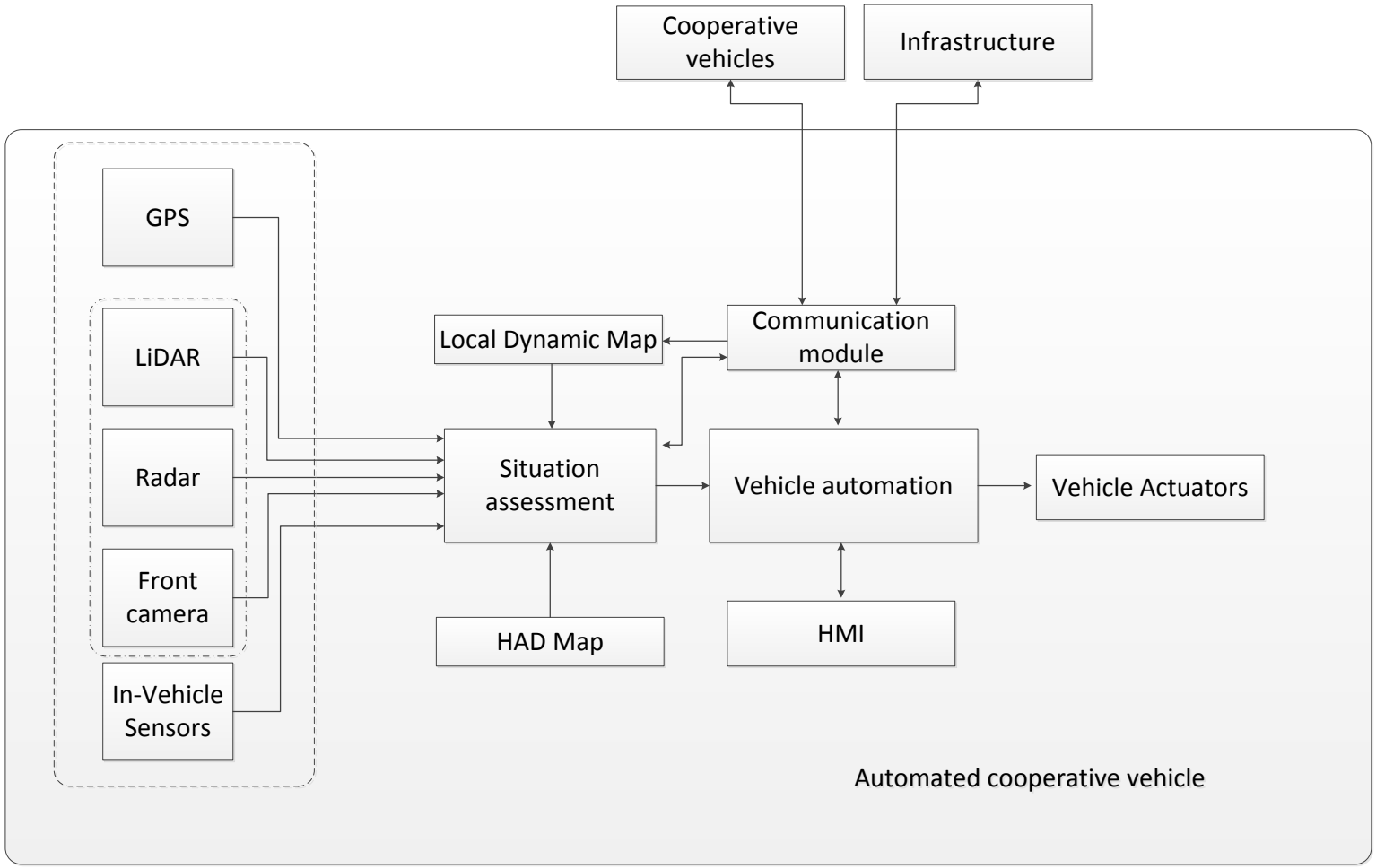
General concept of in-vehicle architecture for fully-automated cooperative vehicle



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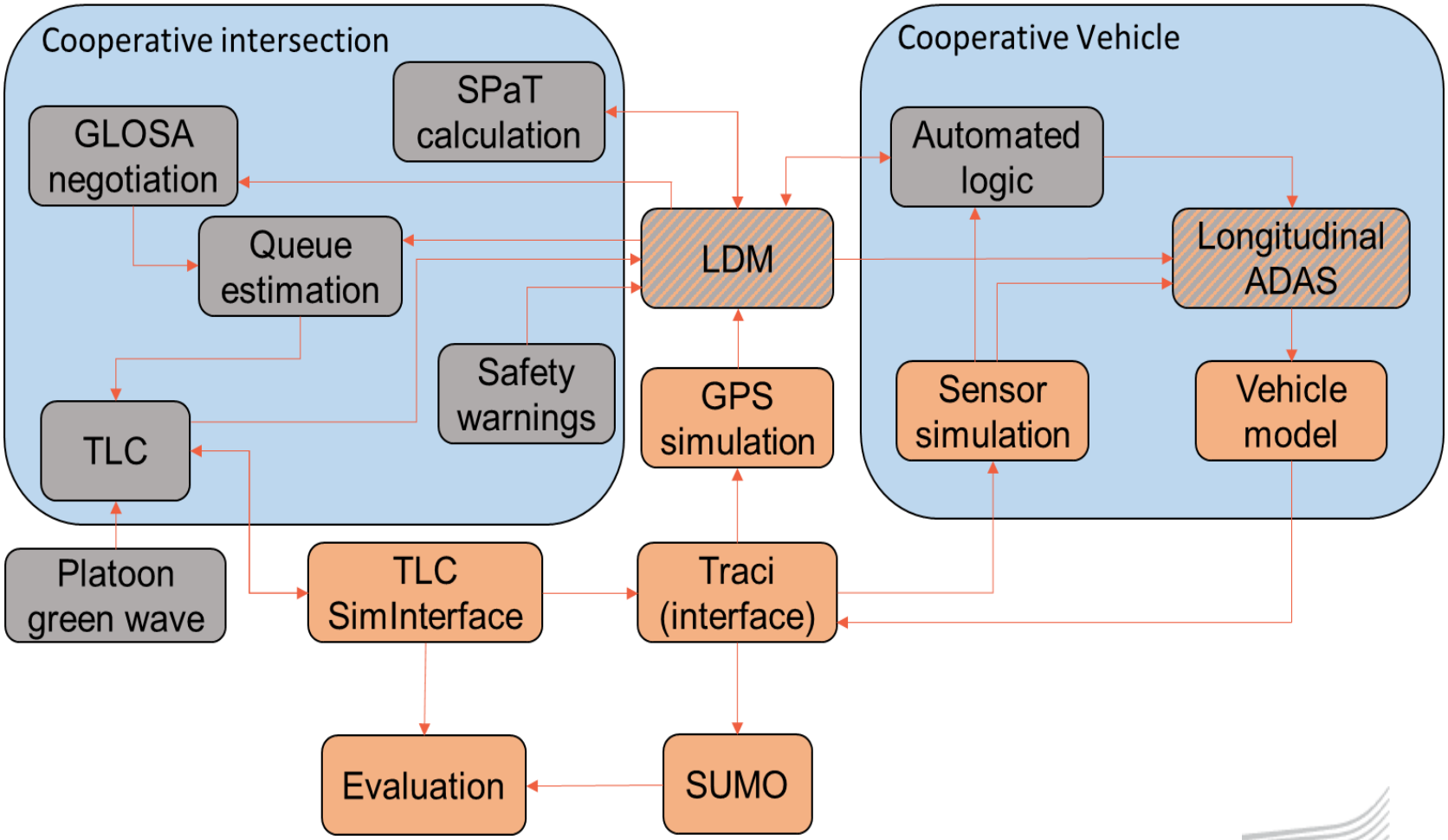
MAVEN high level simulation architecture



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MAVEN benefits

Infrastructure service providers

MAVEN is testing cost-effective technical solutions for the deployment of autonomous vehicles using real-world prototype vehicles and traffic simulation studies

Cities

MAVEN is helping road authorities and cities reach the understanding of the requirements for a smooth transition towards integrated, safe and sustainable automated vehicles and their impact

Automotive industry

MAVEN is developing C-ITS communication standard interactions between vehicles (V2V) and the infrastructure (V2I) to support platooning, negotiation and scheduling algorithms

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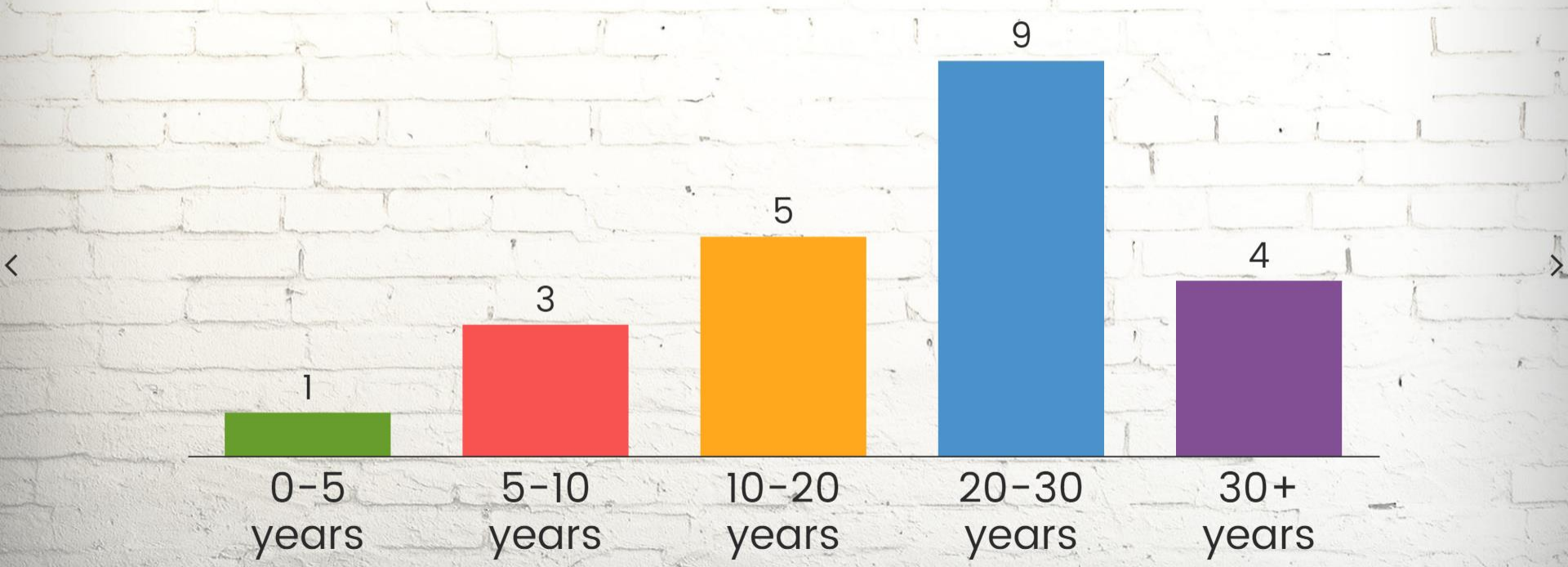
Go to **www.menti.com** and use the code **38 53 46**

When do you think 10% of the vehicle fleet in your city will be automated vehicles?

Mentimeter



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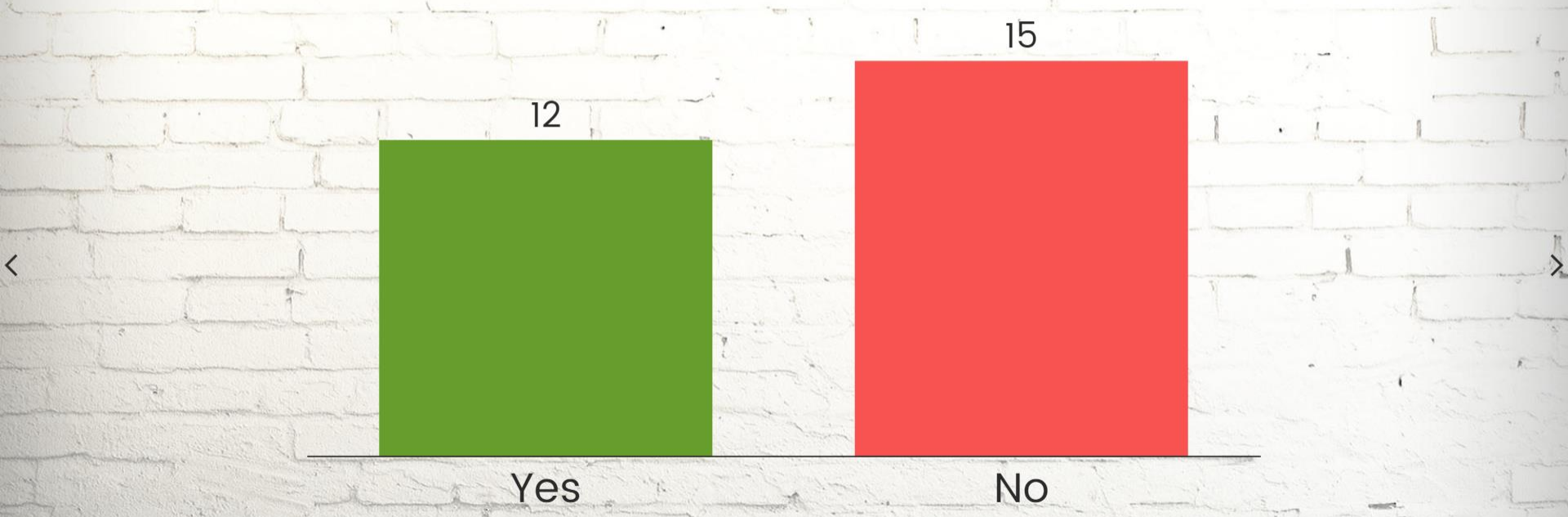
Is your local authority preparing for the introduction of automated vehicles?

Mentimeter



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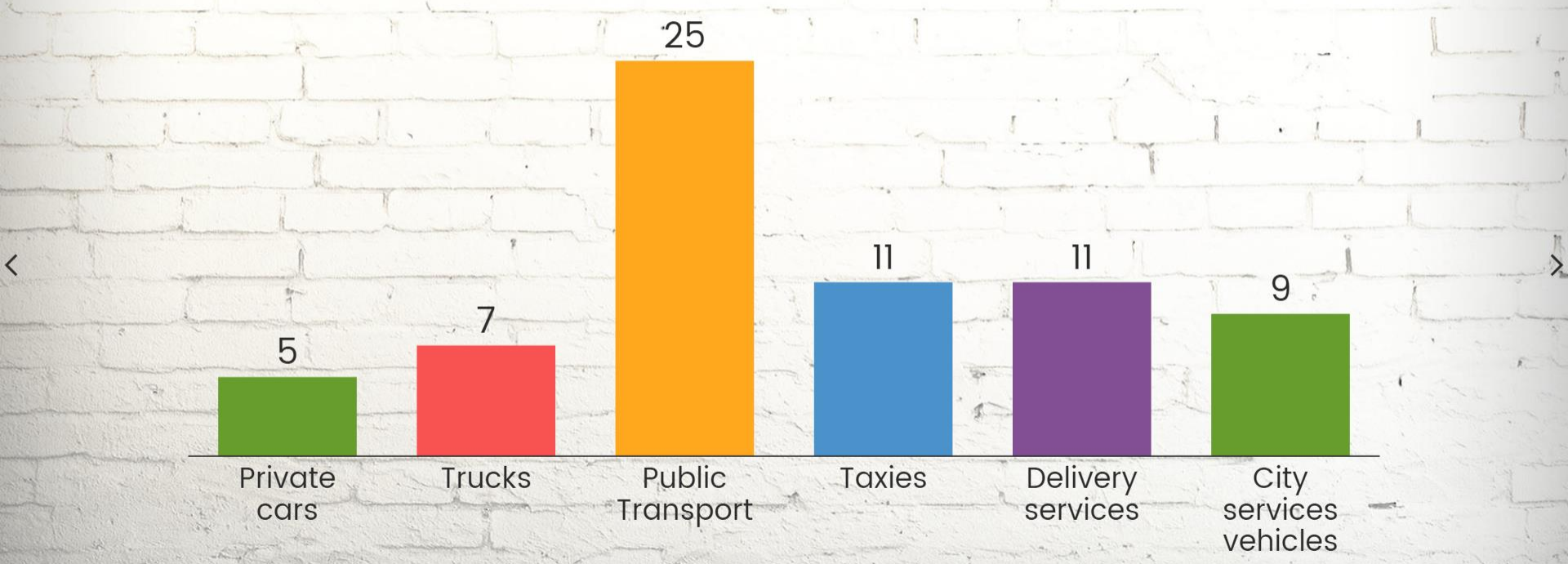
Which vehicle class has the most potential for automation?

Mentimeter



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What are the most critical issues in your city related to mobility and infrastructure [no spaces]?

Mentimeter

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What is MAVEN for you [no spaces]?

Mentimeter

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MAVEN transition roadmap

- Main objective: to assist authorities in determining their role and responsibilities for traffic management in transition phases
  - ✓ identification of needs, requirements, (specific) challenges
  - ✓ identification of possible technical and nontechnical solutions
  - ✓ determination of a realistic framework of the most feasible solutions for the local authorities with timelines, by taking into account various factors, potential impacts
  - ✓ action plan
- Dimensions: the roadmap will consider political, institutional and organisational aspects, as well as practical ones such as the safety and comfort of special road user categories (e.g. VRUs)
- Target audience: policy makers, road authorities, standardisation bodies, industry and other stakeholders

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Transition roadmap structure (1/6)

1. Scene setting
2. Transitioning to the MAVEN approach to connected, cooperative automated road transport
3. Related activities of selected cities
4. Conclusions/steps to be taken

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Transition roadmap structure (2/6)

1. Scene setting
    a. City transport/smart city policy today
    b. Traffic management today
    c. C-ITS and cities today
    d. MAVEN: what it is and what it is not?
    e. MAVEN, CoExist & TransAID in relation to wider automated road transport picture

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Transition roadmap structure (3/6)

2. Transitioning to the MAVEN approach to connected, cooperative automated road transport

a. Infrastructure

i. Technical requirements of MAVEN use cases from ICT infrastructure

ii. Technical requirements of MAVEN use cases, from the perspective of vehicles

iii.What are the pros and cons of CAVs over autonomous vehicles and CVs?

Phase II of document

i.Which road sections or which parts of the road network can gain greatest benefits from the MAVEN use cases?

ii.Need for classification of roads? (results from simulations & demos)

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Transition roadmap structure (4/6)

2. Transitioning to the MAVEN approach to connected, cooperative automated road transport

b. Societal, economic & environmental issues

i. How can the safety of other road users, including vulnerable road users (VRUs), be guaranteed?

ii. How to reduce negative impacts on traffic efficiency?

iii. How to increase environmental impacts?

Phase II of document

i. Public acceptances of AVs? - > CTU (WP7 interviews)

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Transition roadmap structure (5/6)

2. Transitioning to the MAVEN approach to connected, cooperative automated road transport

c. Organisational/traffic management

i. Who decides to make platooning happen? What is the role of the authorities and road operators? what influence does it have?

ii. What skills are required for the traffic manager of the future? Is there still a need for TMCs in future?

iii. How to shift from a more operational to a more strategic role?

iv. What will be the impacts on traffic patterns of different mixes of autonomous, connected/cooperative, partially automated and non-automated vehicles?

v. What will be the effect of the above in different scenarios (e.g. congestion conditions, multiple junctions, presence of VRUs)

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Transition roadmap structure (6/6)

2. Transitioning to the MAVEN approach to connected, cooperative automated road transport

d. Operational

i. How scalable is the MAVEN approach?

ii. Interaction between AVs and non-AVs and VRUs?

iii. What happens in case of system malfunction?

iv. How can the functionality of the system be maintained over time (e.g. via periodic inspections at authorised centres or real-time plausibility checks mechanisms)

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