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COPENHAGEN
17 – 21 SEPTEMBER 2018
Quality of life

DISTRIBUTED INTELLIGENCE IN PAC V2X PROJECT

Oyunchimeg Shagdar, VEDECOM Institute
Pierre Merdrignac, VEDECOM Institute
Elias K. Xidias, INRIA
Gérard Segarra, VICI

PAC V2X (AUGMENTED PERCEPTION BY V2X COOPERATION)

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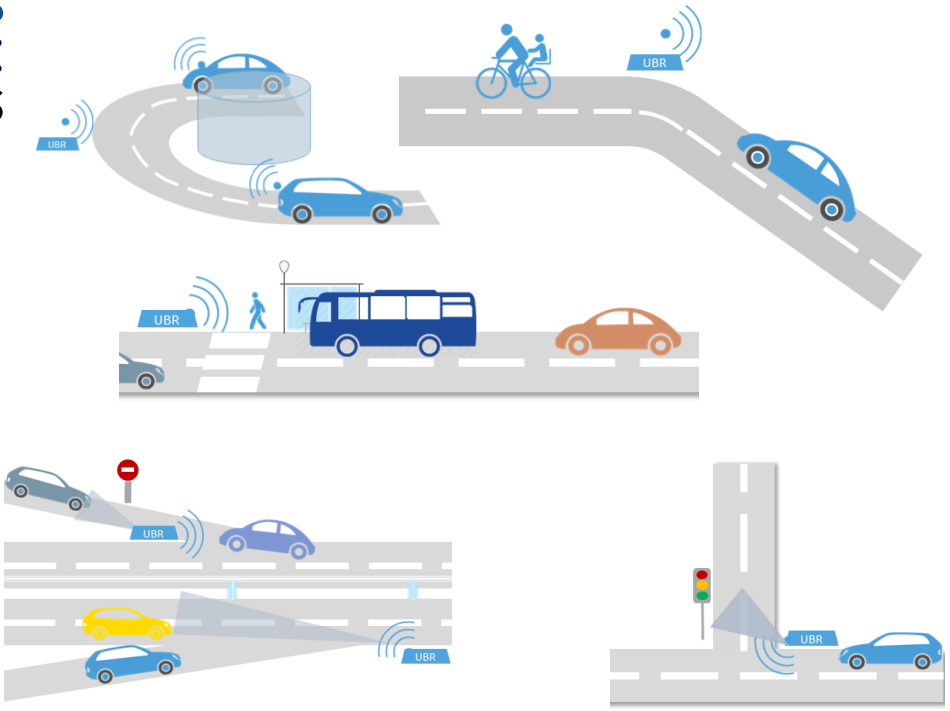
- **Objective**
- **Extending vehicles' perception** by **V2X cooperation** exploiting **sensor-equipped RSUs** installed at **complex road sections**: intersections, highway entry/exit ramps, bus stations, tolling area, roadwork zones etc.
- **Planning**
- Specifications: T0 to T6 (T0: Sep. 2016)
- Development: T6 to T18
- Validation: T18 to T30
- Experimentation/demonstration: T30 to T36

Research institutes

Major industrial groups

SMEs



System Overview

PKI server

- Certificate downloading

System supervisor

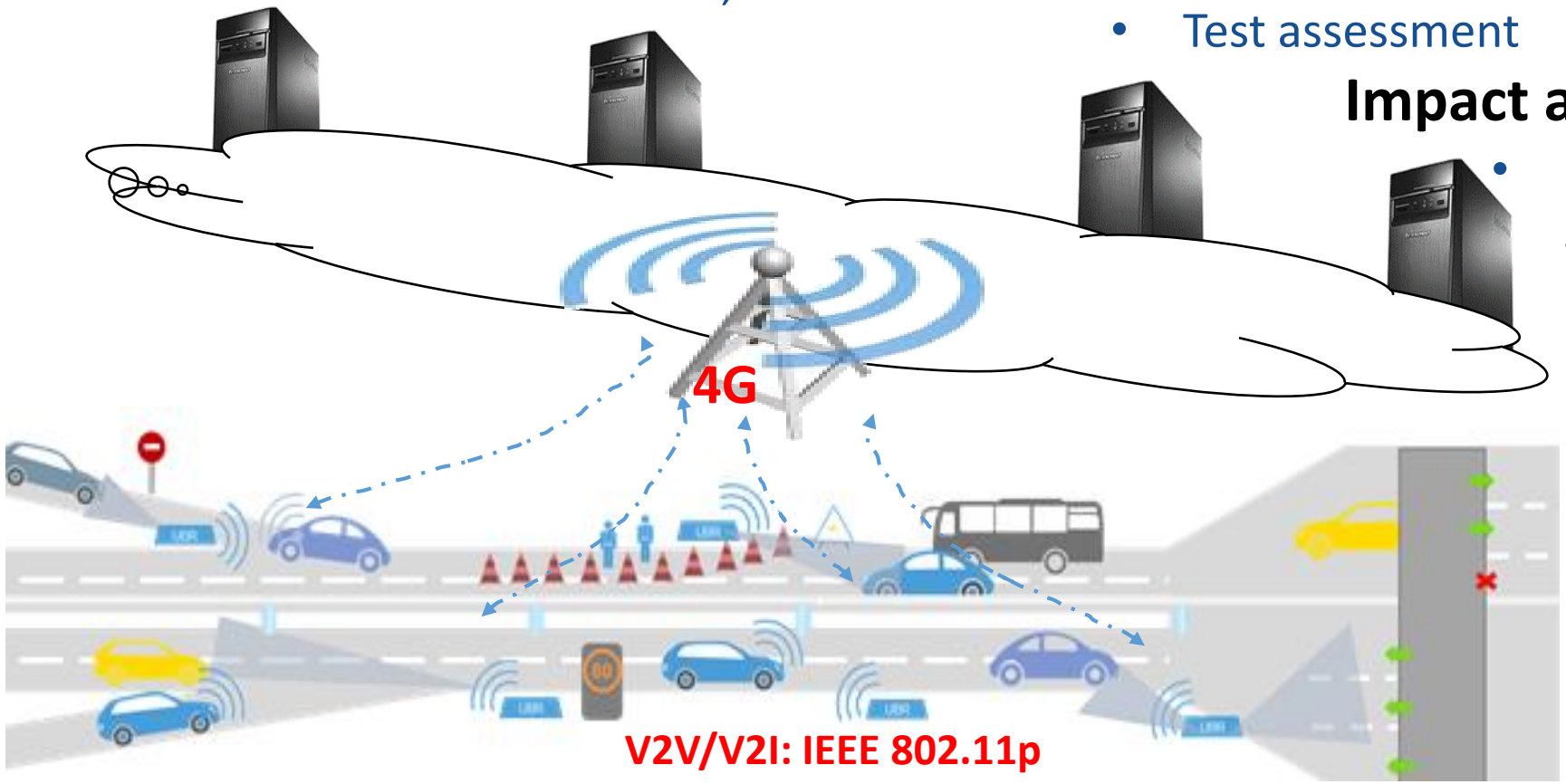
- Roadwork warning, contextual speed announcement, tolling announcement, etc.

Assessment manager

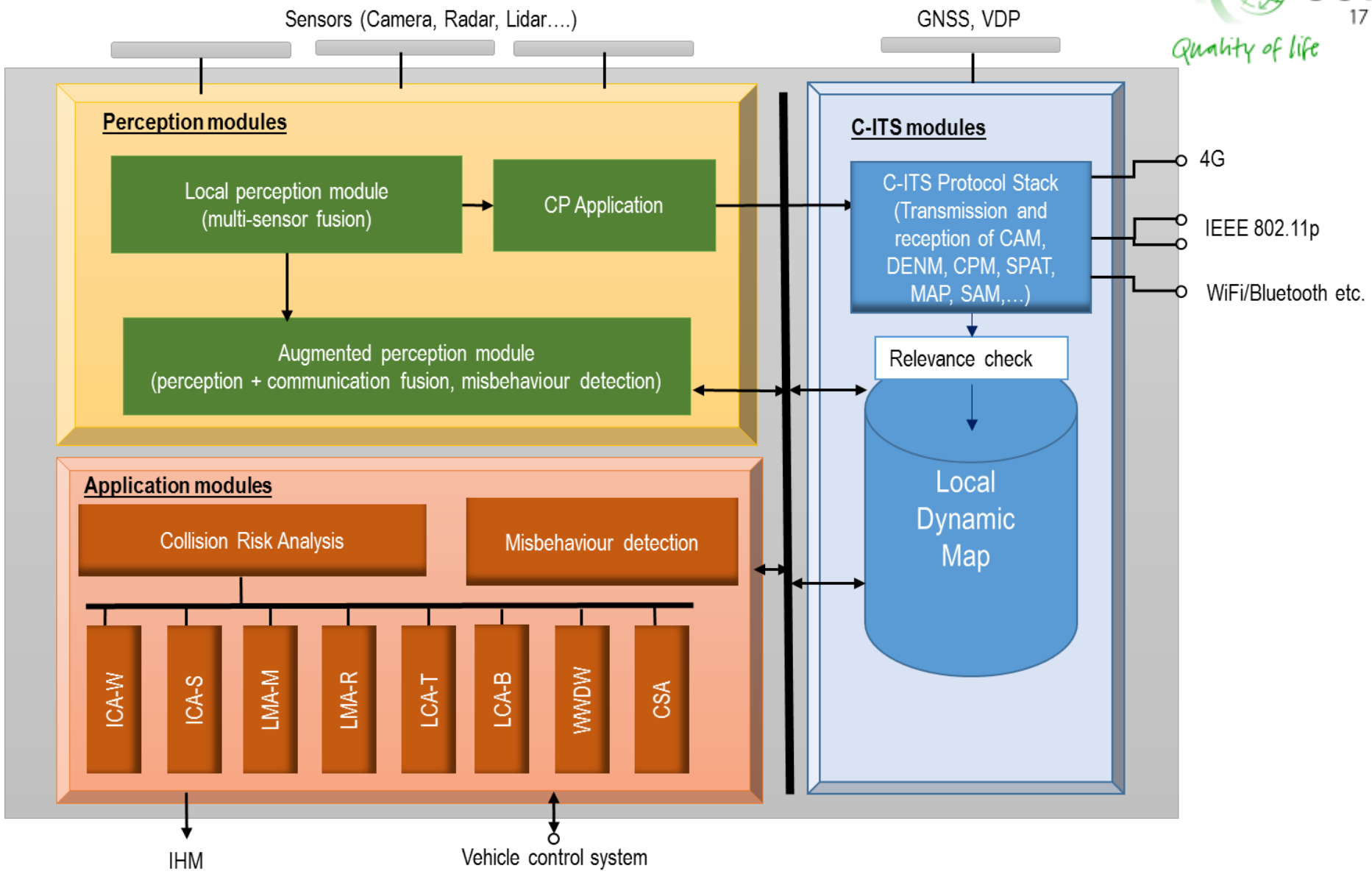
- Test assessment

Impact analysis server

- Impact analysis on safety and efficiency



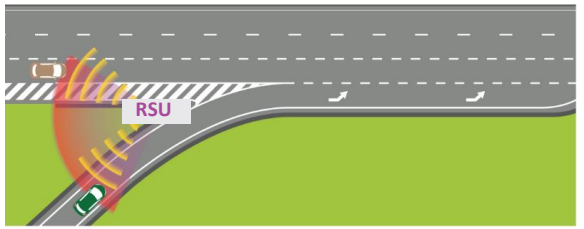
OBU/RSU System Architecture



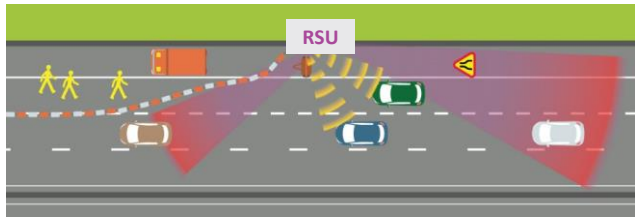
COLLISION AVOIDANCE

- Main objective of several applications
  - e.g. Lane Merging Assist for Motorway Access (LMA-M)
- Act on the speed of vehicles having a risk of collision

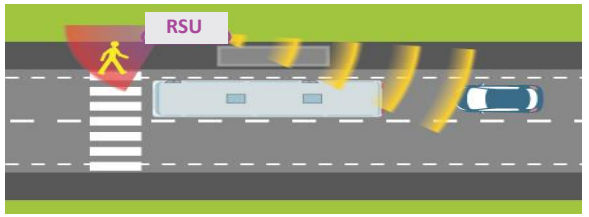
- Broadcast of information by RSU to assist vehicles
  - Collective Perception Messages to signal detected object
  - **Maneuver Coordination Messages to provide trajectories**



Motorway access assist

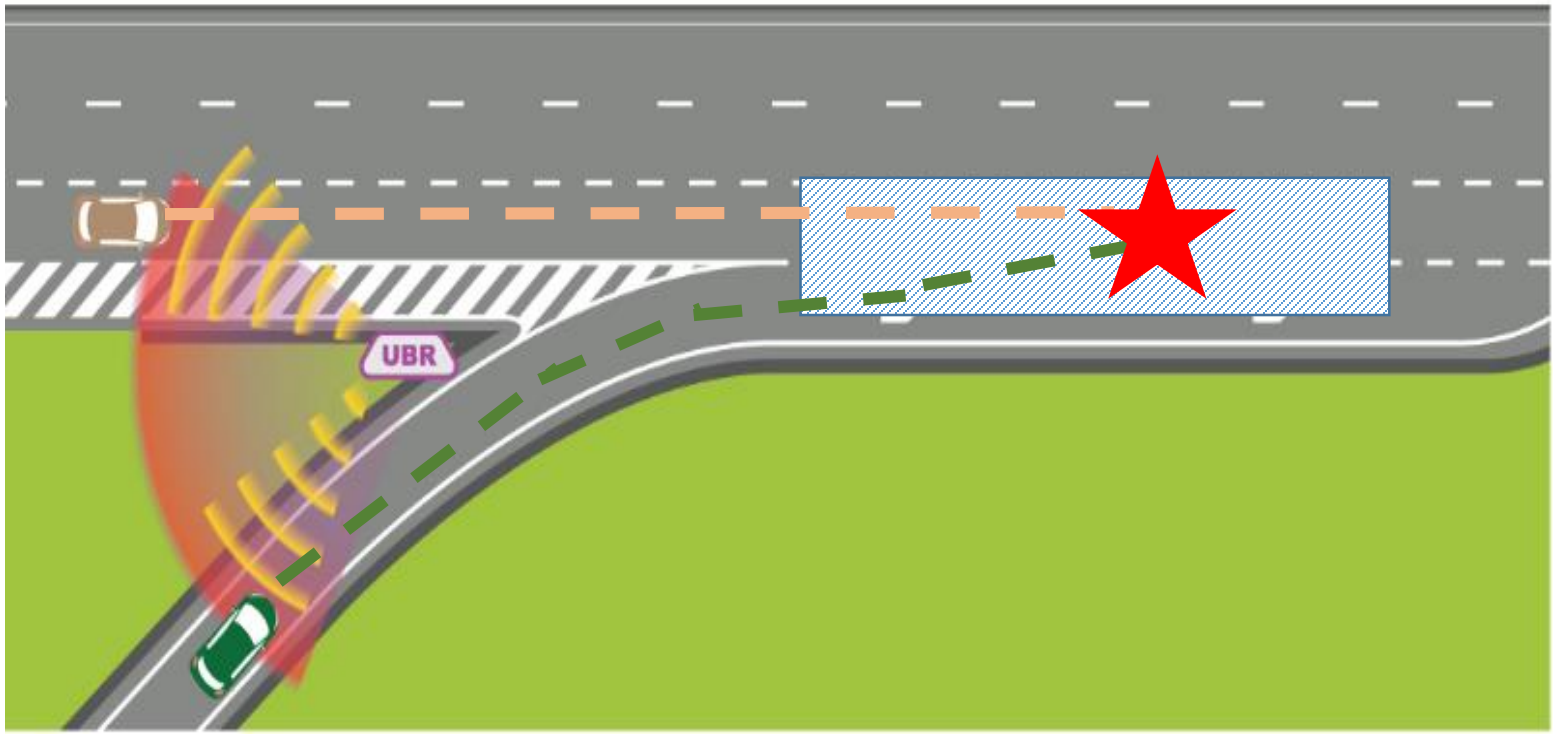


Active roadwork warning



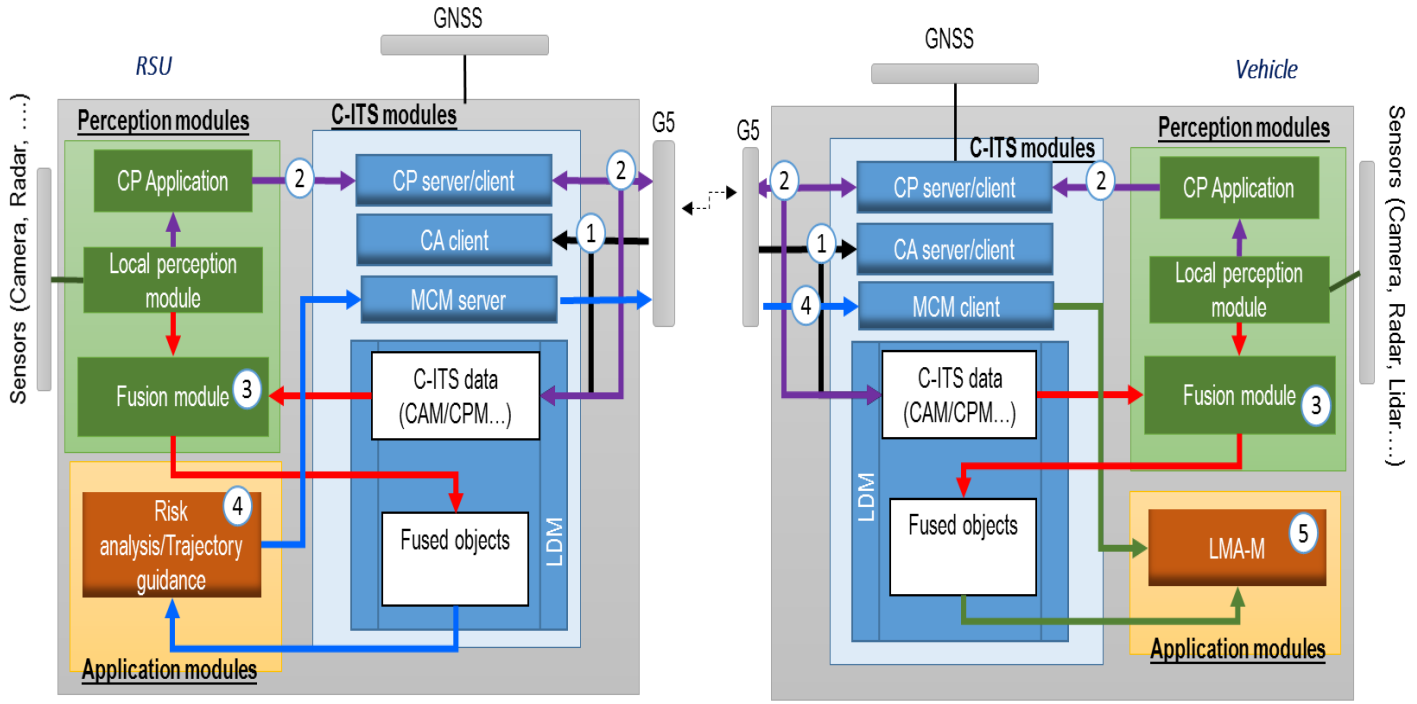
Overtaking with limited perception

LANE MERGING ASSIST (LMA-M) CASE STUDY



- Monitor insertion area and upstream traffic to ease autonomous vehicle insertion
- Provide trajectory guidance to target vehicles
- System assessment using reference behavior models

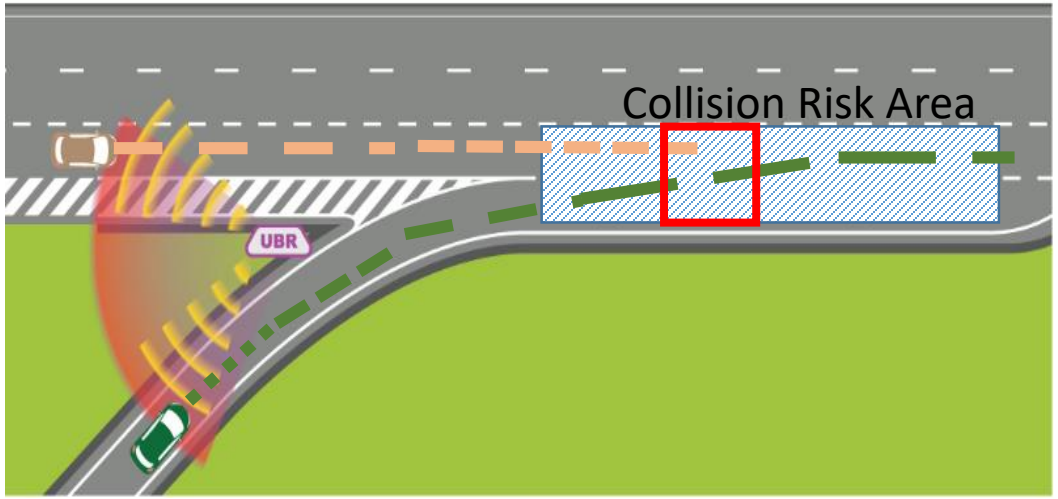
FUNCTIONAL CHAIN FOR LMA-M



1. CAM are broadcasted and stored in LDM
2. CPM are broadcasted and stored in LDM
3. Augmented perception is constructed based on the C-ITS data and the local perception.
4. RSU collision risk analysis and trajectory guidance module may generate MCM packets.
5. LMA-M module of vehicle can proceed for an appropriate maneuver.

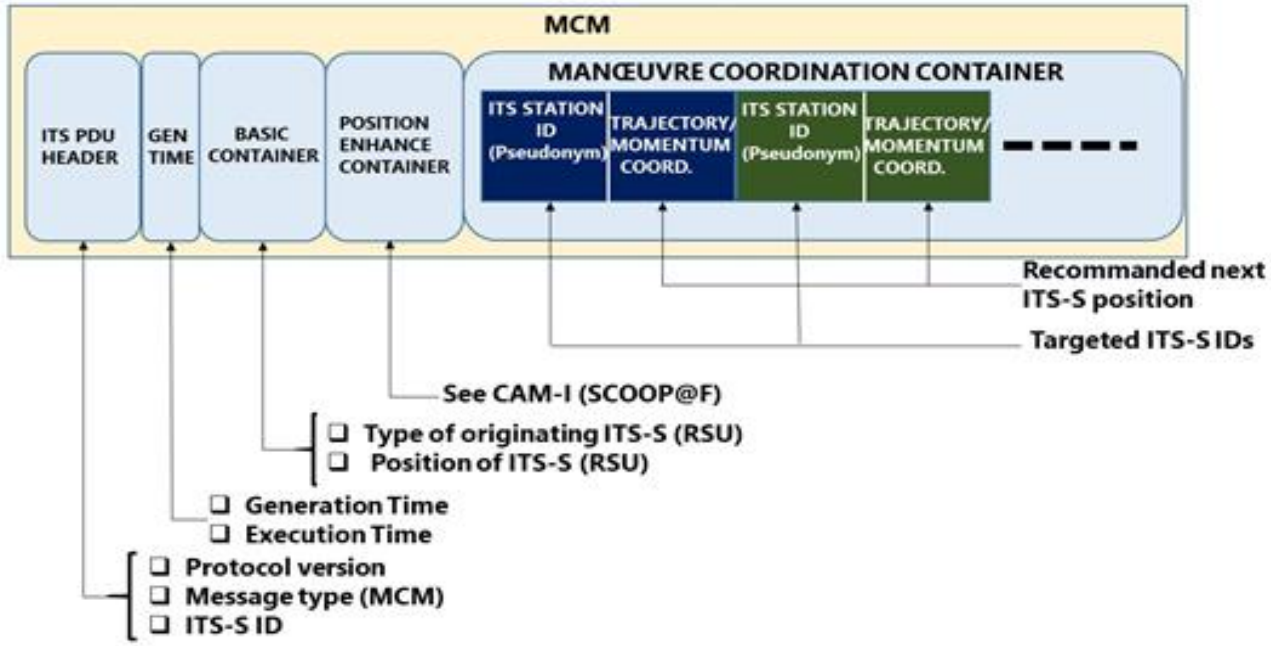
TRAJECTORY GUIDANCE – ACTING ON VEHICLES SPEED

- Target, accelerate green vehicle to be inserted before pink vehicle
  - Respect traffic regulations
  - Collision Risk Area to avoid emergency braking (minimum inter-vehicle distance)
  - Highest risk of collision identifed at the red square
  - Define speed profiles so that collision is avoided
- If no solution application, priority remains to pink vehicle



STANDARDISATION OF MCM

- Under development in ETSI TC ITS WG1



ONGOING AND FUTURE WORK

- Development of functionalities for collision avoidance
  - Augmented perception for vehicles and RSUs combining local perception data and received V2X standard messages
  - Risk analysis for detecting at least two vehicles having trajectories intersecting at a certain collision risk area
  - Motion prediction to anticipate vehicles trajectories and speed
  - Trajectory guidance from the RSU by usage of MCM
- Development of an assessment system
  - Analysis of the system's elements (vehicles and RSU) behavior agianst reference models
  - Collision avoidance strategies assissed in 6 use cases

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THANK YOU

PAC V2X
PERCEPTION AUGMENTÉE PAR COOPÉRATION V2X

Contact: oyunchimeg.shagdar@vedecom.fr
Website: https://project.inria.fr/pacv2x/