

Dr. Ignacio Llatser Martí, Robert Bosch GmbH



IMAGinE

12 MAY 22

FINAL EVENT



V2X Message Specification for Cooperative Driving

AGENDA

Collective Perception Message

Maneuver Coordination Message

IMAGinE Driving Strategy Message

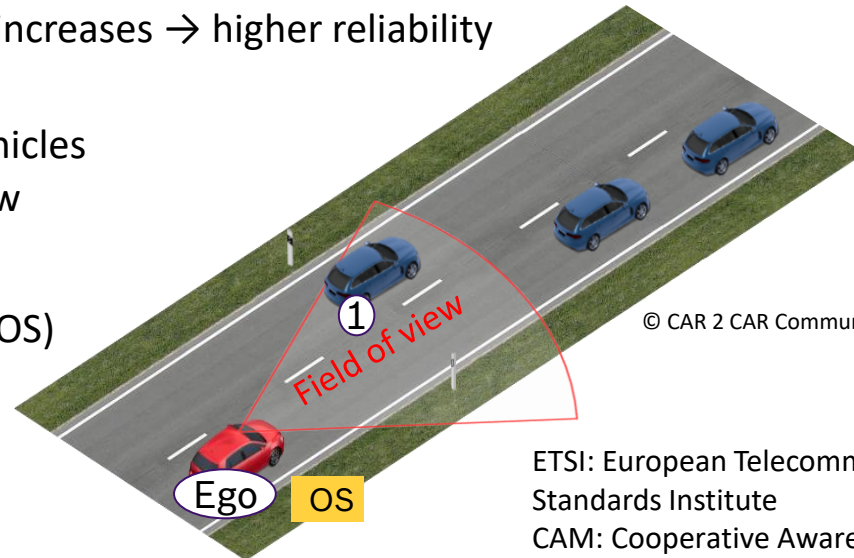
Collective Perception

Introduction

- Vehicles exchange objects detected by sensors with nearby vehicles
 - Using Collective Perception Messages (CPM) currently in standardization at ETSI
 - Each vehicle gets sensor-based object lists from other traffic participants
 - Redundancy for sensor fusion increases → higher reliability

Use Case: Detection of vehicles outside sensor field of view

- Ego sees ① via on-board sensors (OS)



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ETSI: European Telecommunications
Standards Institute
CAM: Cooperative Awareness Message

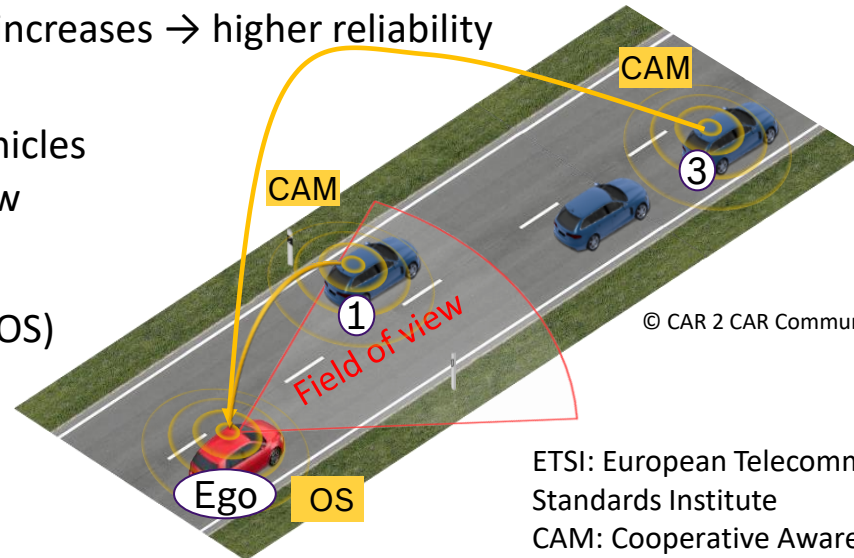
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- Ego receives CAM from ① and ③



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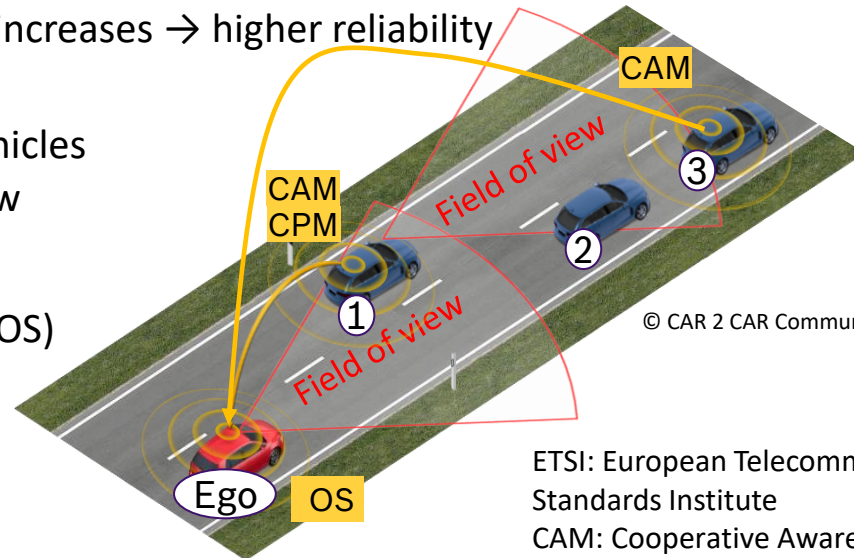
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- Ego sees ① via on-board sensors (OS)
- Ego receives CAM from ① and ③
- Ego sees ② indirectly by a CPM transmitted from ①



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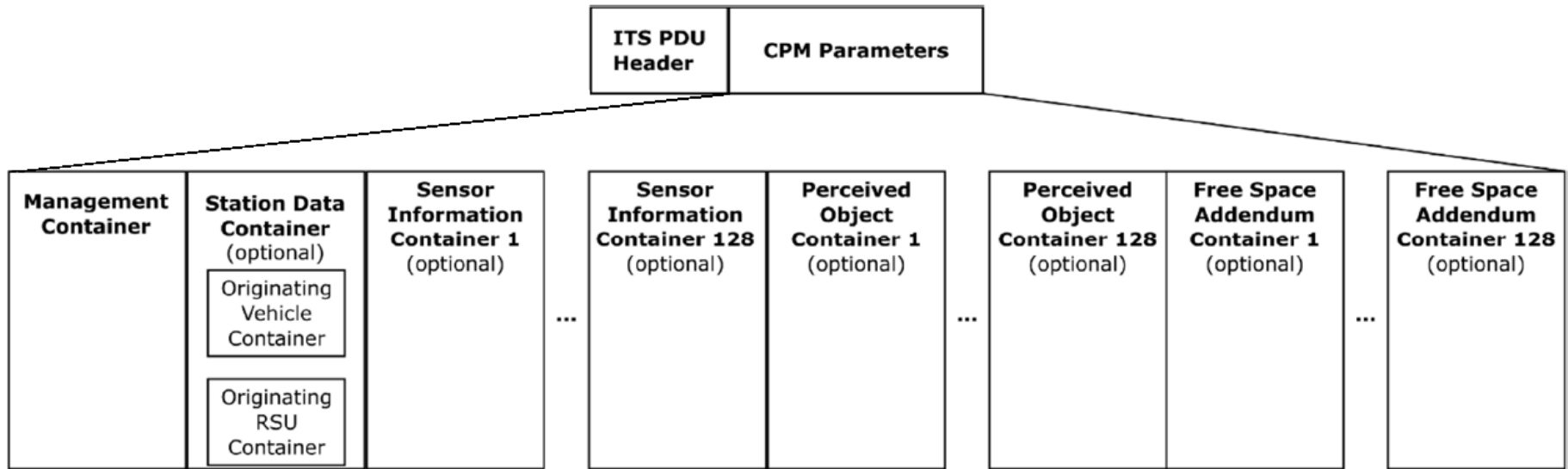
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Collective Perception

Collective Perception Message Format



- A CPM is composed of a header and multiple containers

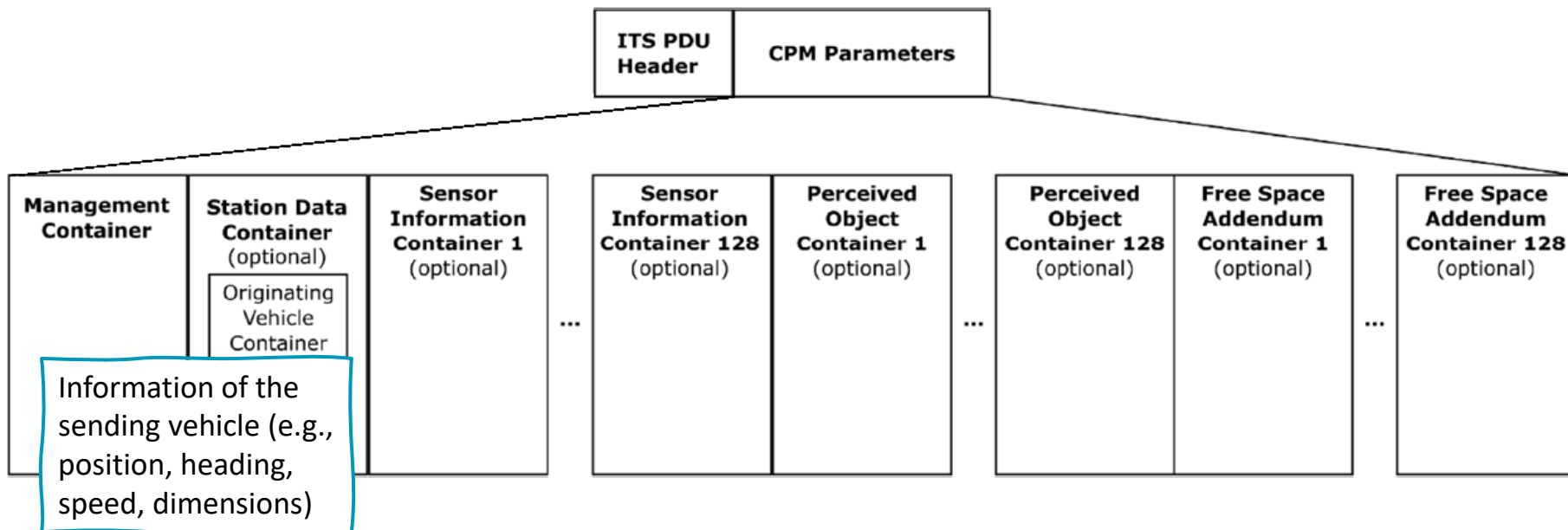


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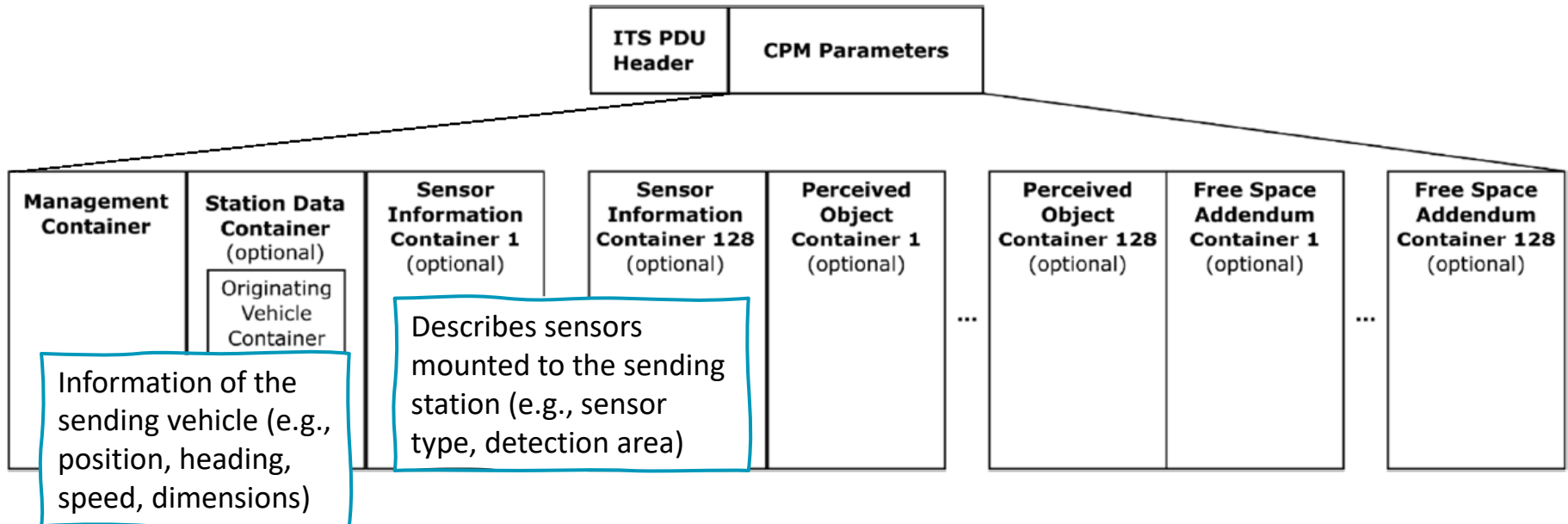


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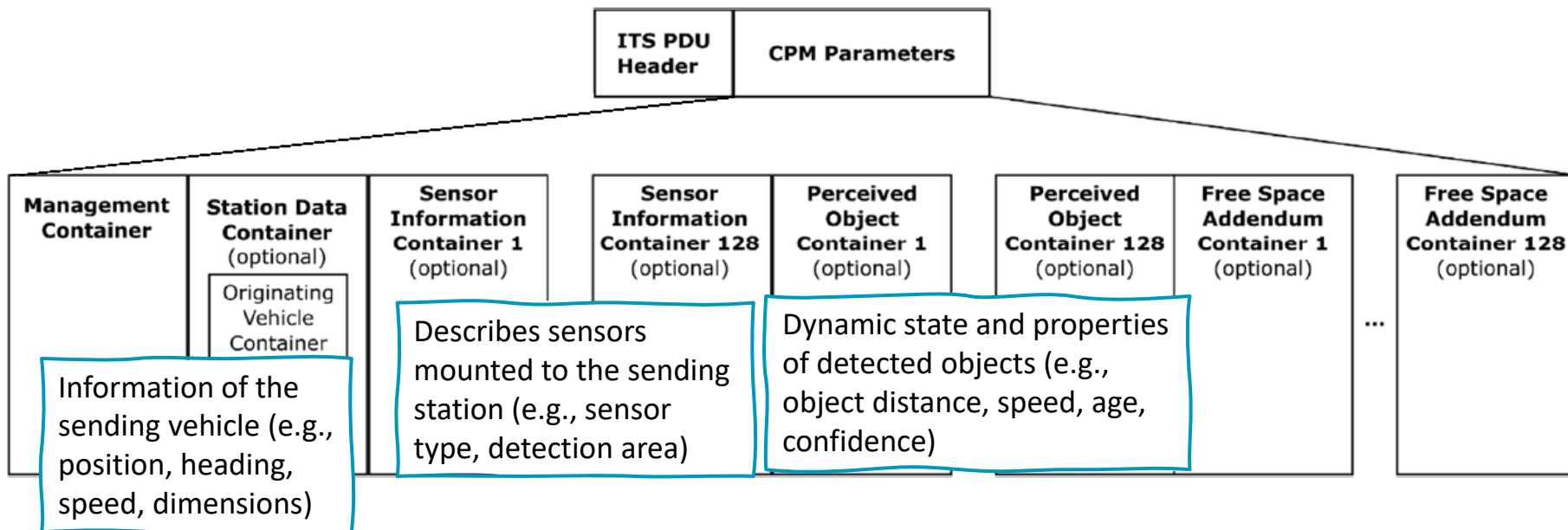


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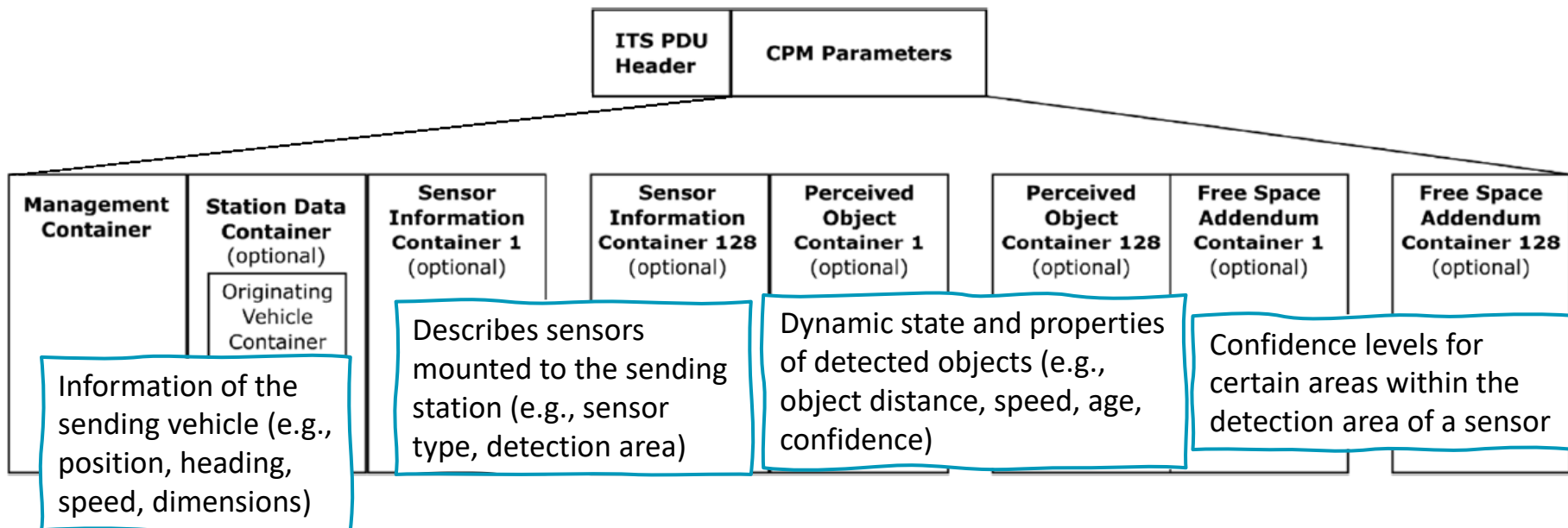


Collective Perception

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Collective Perception

IMAGinE Contribution to standardization

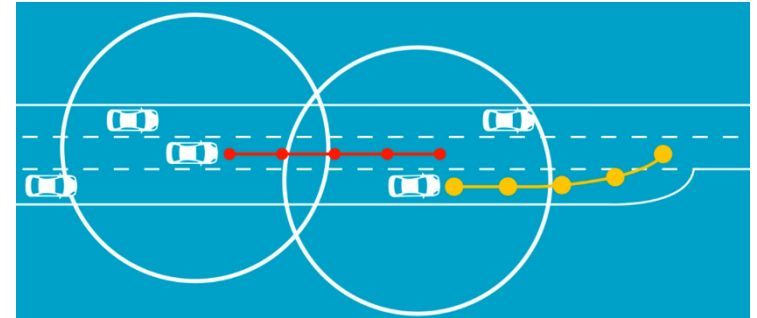
- Coordination of ETSI Work Item “Collective Perception Service”
 - 2017 - 2021: Hendrik-Jörn Günther (Volkswagen)
 - 2021 - now: Florian Schiegg (Bosch)
- Change proposals for CPM format
 - Format of perceived object acceleration values
- Change proposals for CPM generation rules
 - Perceived object selection based on utility function
 - Fixed generation rate for non-motorized perceived objects

Maneuver Coordination

Maneuver Coordination Message Format

- Maneuver Coordination Message (MCM) not standardized so far
 - IMAGinE MCM specified to fulfill our requirements and provided as input to ETSI

Container	Description	Example data fields
Header	Basic message information	Station ID, message generation time, vehicle automation state
Current position	Position of the sending vehicle	Reference position, current lane position
Trajectories	List of MCM trajectories	Trajectory course (vehicle position relative to lane over time, in polynomial form)
		Changes in street topology (e.g., number of lanes, intersection)
		Cooperation cost

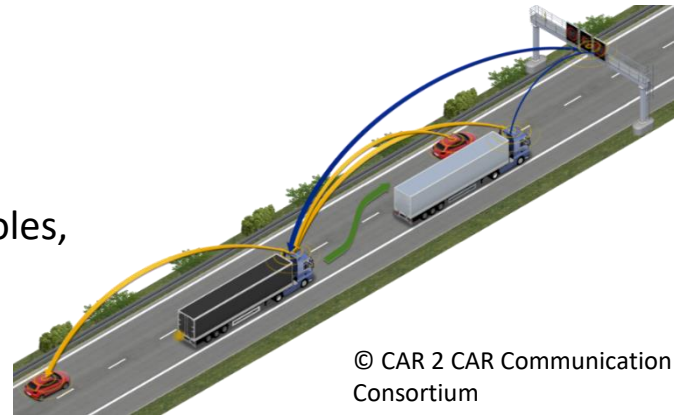


IMAGinE Driving Strategy

Purpose and Message Format

- Purpose of IMAGinE Driving Strategy Service
 - Strategic maneuver negotiation (1 minute to 1 hour)
 - Synchronization of distributed state machines
 - When all vehicles reach a common state, tactical maneuver coordination begins
- IMAGinE Driving Strategy Message
 - Current session + desired session (optional)
 - Session: session ID, state, list of participants with roles, payload (optional).

Used by IMAGinE F6
“Cooperative truck
overtaking”



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THANK YOU

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