



Improve Ramp Control + Support Merging

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www.ecomove-project.eu



Outline

- Introduction eCoMove – project
- Improve Ramp Control
- Support Merging
- Conclusions

Projectgoal

To develop a **combination of cooperative systems and tools** using V2V and V2I communication to help:

- drivers sustainably eliminate unnecessary fuel consumption;
- fleet managers manage their vehicles more economically and promote eco-driving through feedback & incentives;
- road operators balance traffic flows in the most energy efficient way.

Target is to reduce by 20% fuel consumption and therefore
CO₂ emission

Waste of fuel consumption

- 22% Inefficient deceleration, lack of anticipation
- 11% Driving too fast
- 11% Inefficient traffic light control
- 11% Poor management of construction sites, traffic incidents
- 15% Congestion

Engineering an integrated system

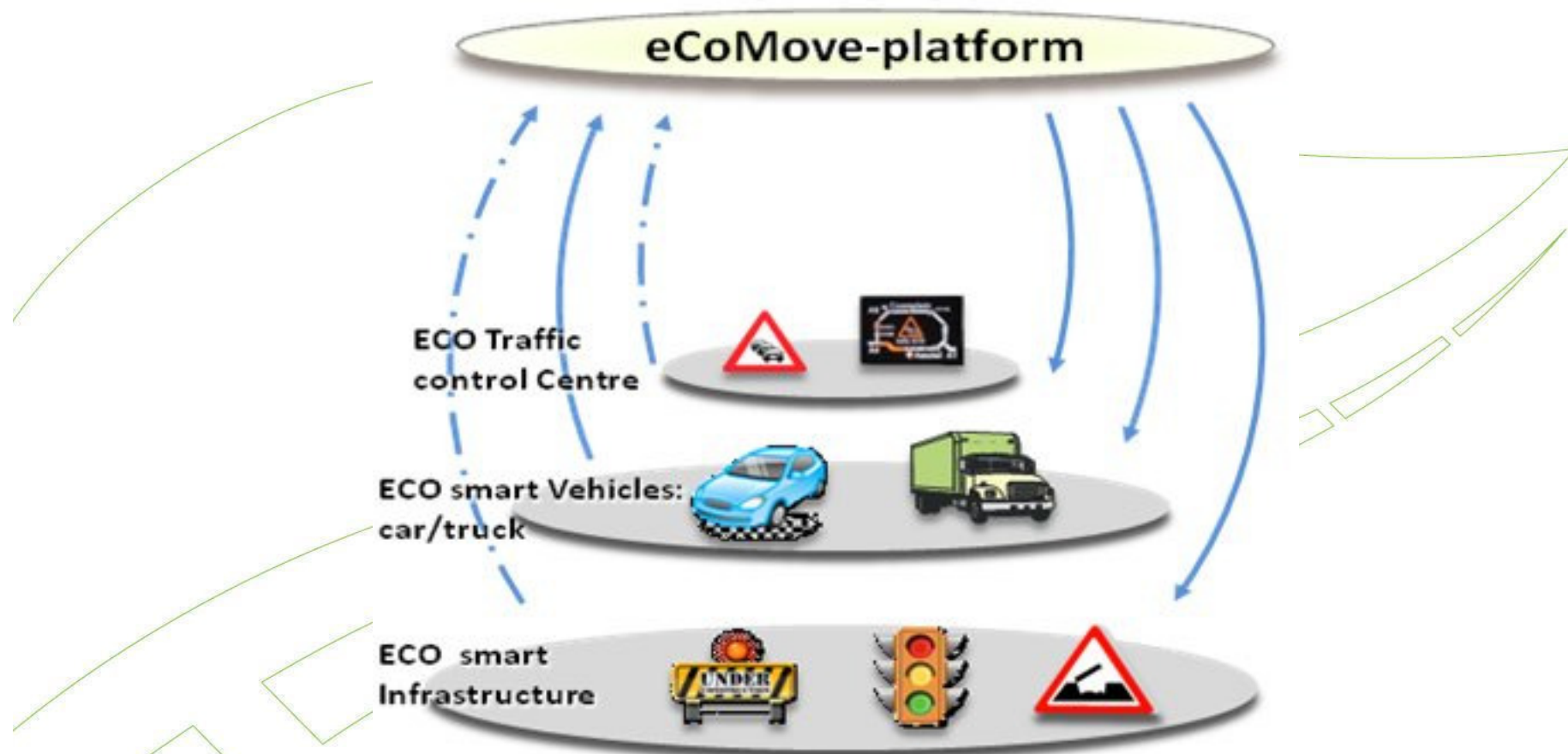
- optimise the vehicle / driver system
 - with respect to traffic light control
 - with respect to traffic flows, road situation and nearby vehicles (queuing, pedestrians, weather etc.)
- optimise the traffic control system
 - adapt to demand of individual vehicles and platoons
 - balance area control for minimum energy use

=> Improve Ramp Control
- optimise the cooperative driver / vehicle / traffic flow
 - => Support Merging**

Waste of fuel consumption

- 22% Inefficient deceleration, lack of anticipation
 - => **Support Merging**
 - => **Improve Ramp Control**
- 11% Driving too fast
- 11% Inefficient traffic light control
 - => **Improve Ramp Control**
- 11% Poor management of construction sites, traffic incidents
- 15% Congestion

Integrated system



General figures

































- Total budget: 22.5 M€
- EC funding: 13.7 M€ (DG-INFISO)
- Duration: 36 Months
- Starting date: 01/04/2010
- Coordinator: ERTICO – ITS Europe
- 10 Countries: Austria, Belgium, France, Italy, Norway, Sweden, the Netherlands, Spain, Sweden, United Kingdom

Partners

Sector	Partner name
Vehicle manufacturer	BMW F+T, CRF, DAF TRUCKS, FFA, VTEC
Automotive supplier	AVL, BOSCH, COBRA, CONTINENTAL, MARELLI, METASYSTEM
Digital map supplier	NAVTEQ, TELE ATLAS
Communication system supplier	NEC, Q-FREE
Mobile and fixed network operator	TELECOM ITALIA
Traffic system supplier	MAT TRAFFIC, PEEK, PTV, TECHNOLUTION, VIALIS
University or research institute	CTAG, DLR, IKA, ROBOTIKER, TNO, TUM
System integrator	LOGICA
Motorway operator	ASFA
Motoring association	RACC
Eco-driving trainer	GO GREEN
ITS association	ERTICO-ITS

The Consortium

Consortium:

 ASSOCIATION PROFESSIONNELLE AUTOROUTES ET OUVRAGES ROUTIERS	 AVL		 Invented for life			
 Centro Tecnológico de Automoción de Galicia	 A PACCAR COMPANY			 trafik & miljø	 INSTITUT FÜR KRAFT- FAHRZEUGE RWTH AACHEN UNIVERSITY	
	 Innovative solutions for traffic systems				 traffic solutions	 traffic mobility logistics.
		 Corporación Tecnológica				
					Coordinator:	

Improve Ramp Control

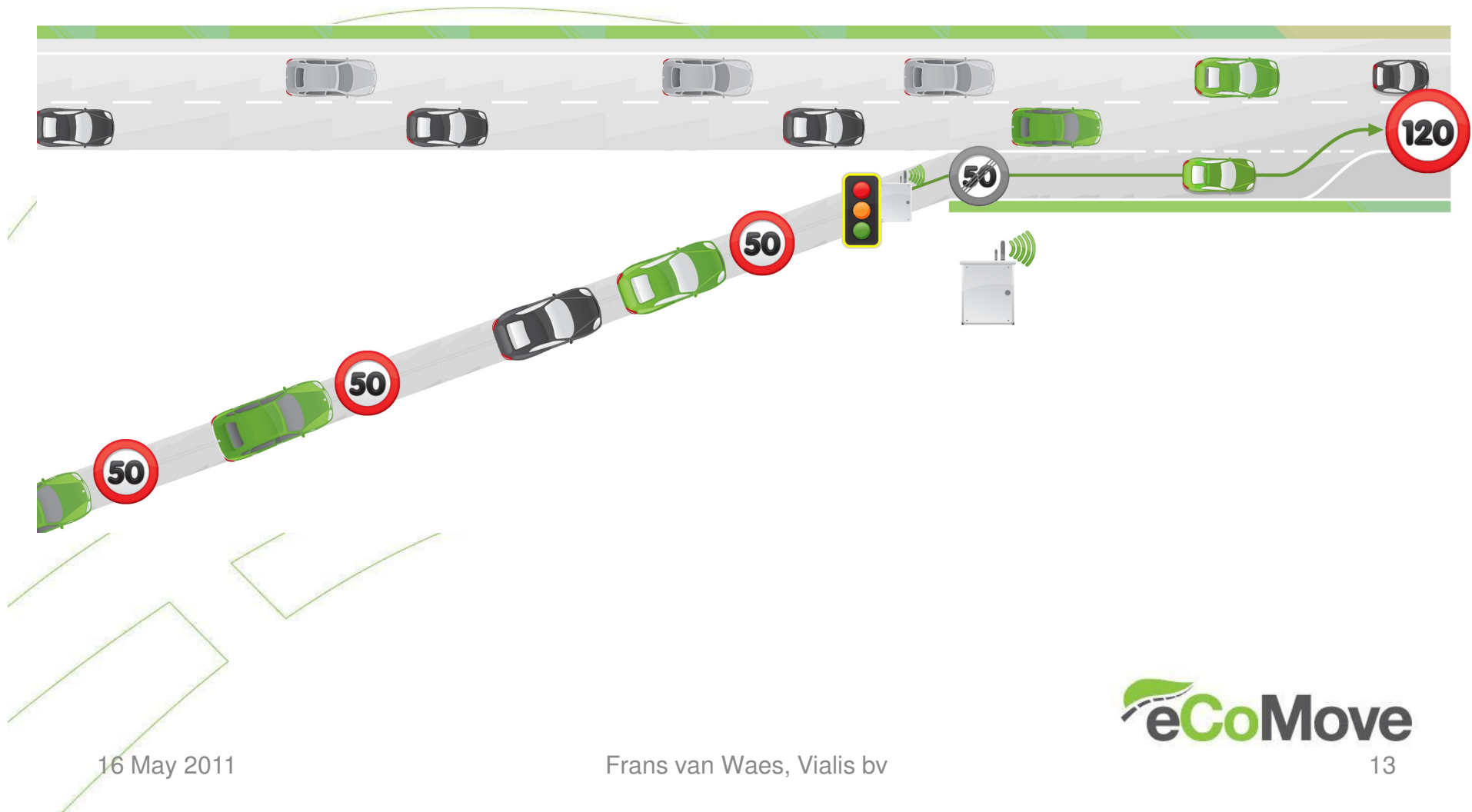
- Current versus Cooperative situation
- Components
- Verification



Current situation

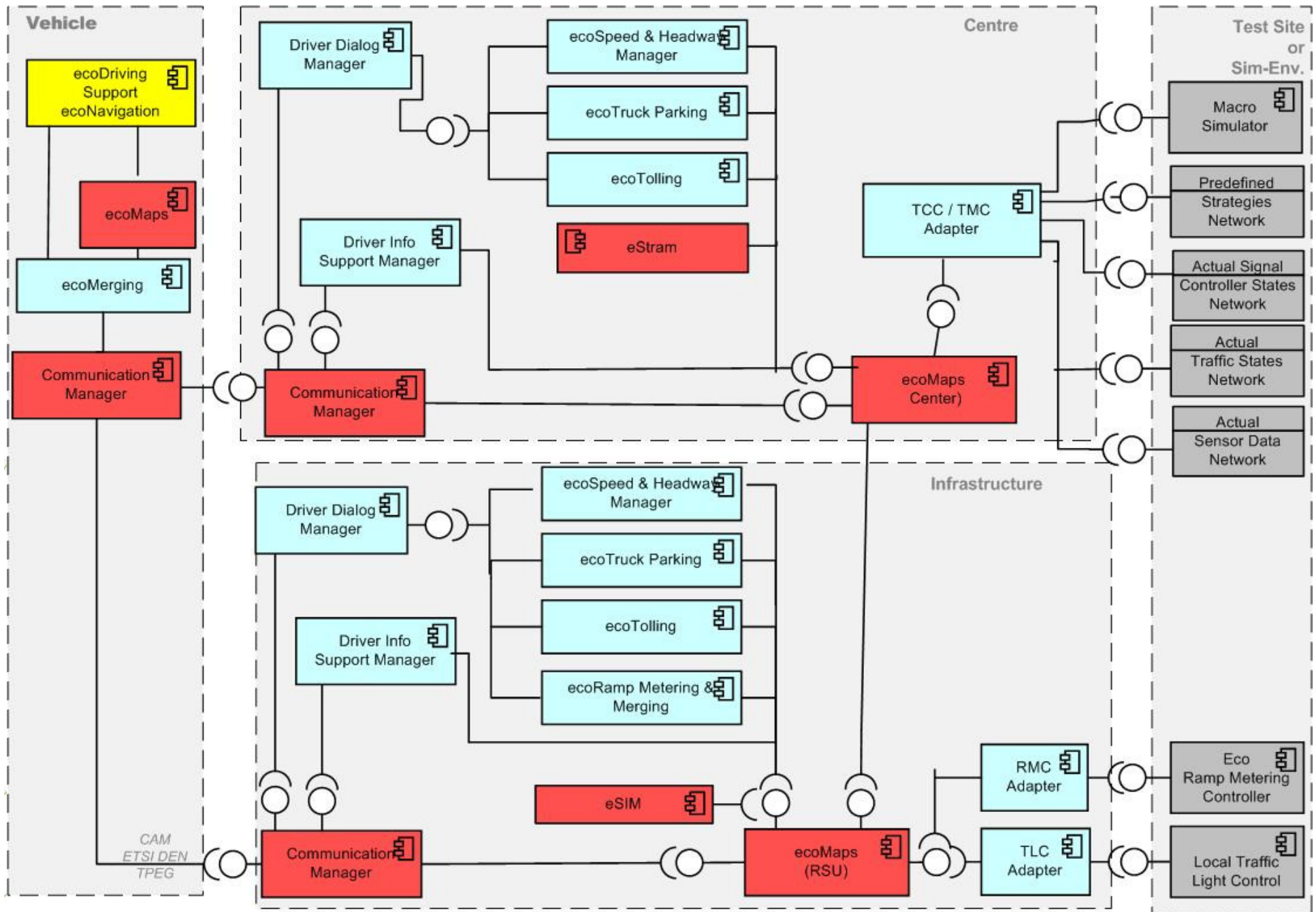


Cooperative situation



“Improve Ramp Control” Step by Step

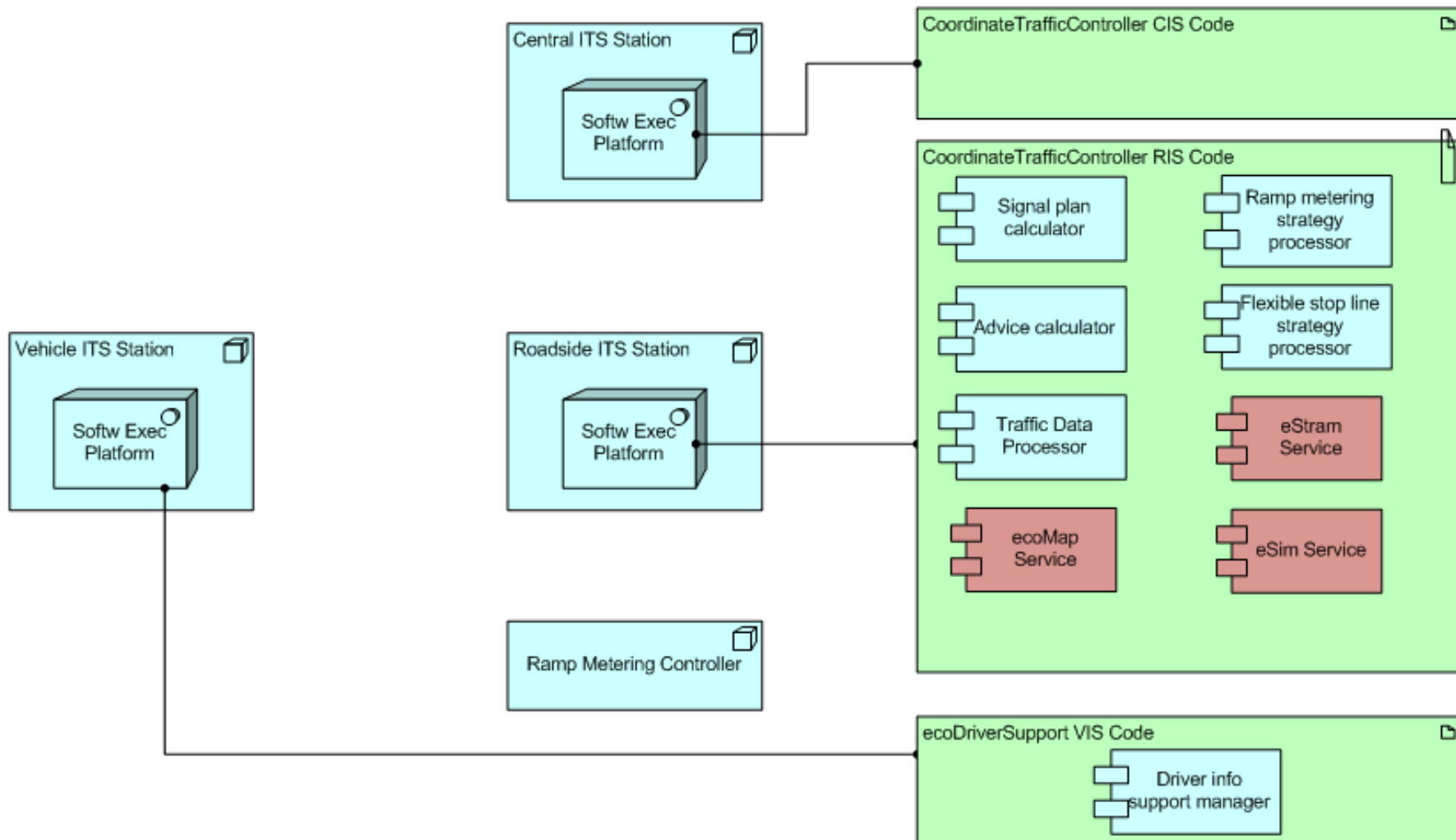
- Traffic state
- Define Ramp Metering Strategy
- Calculation of Signal Plan
- Driving advice
- Optional: Define Flexible Stop Line Strategy



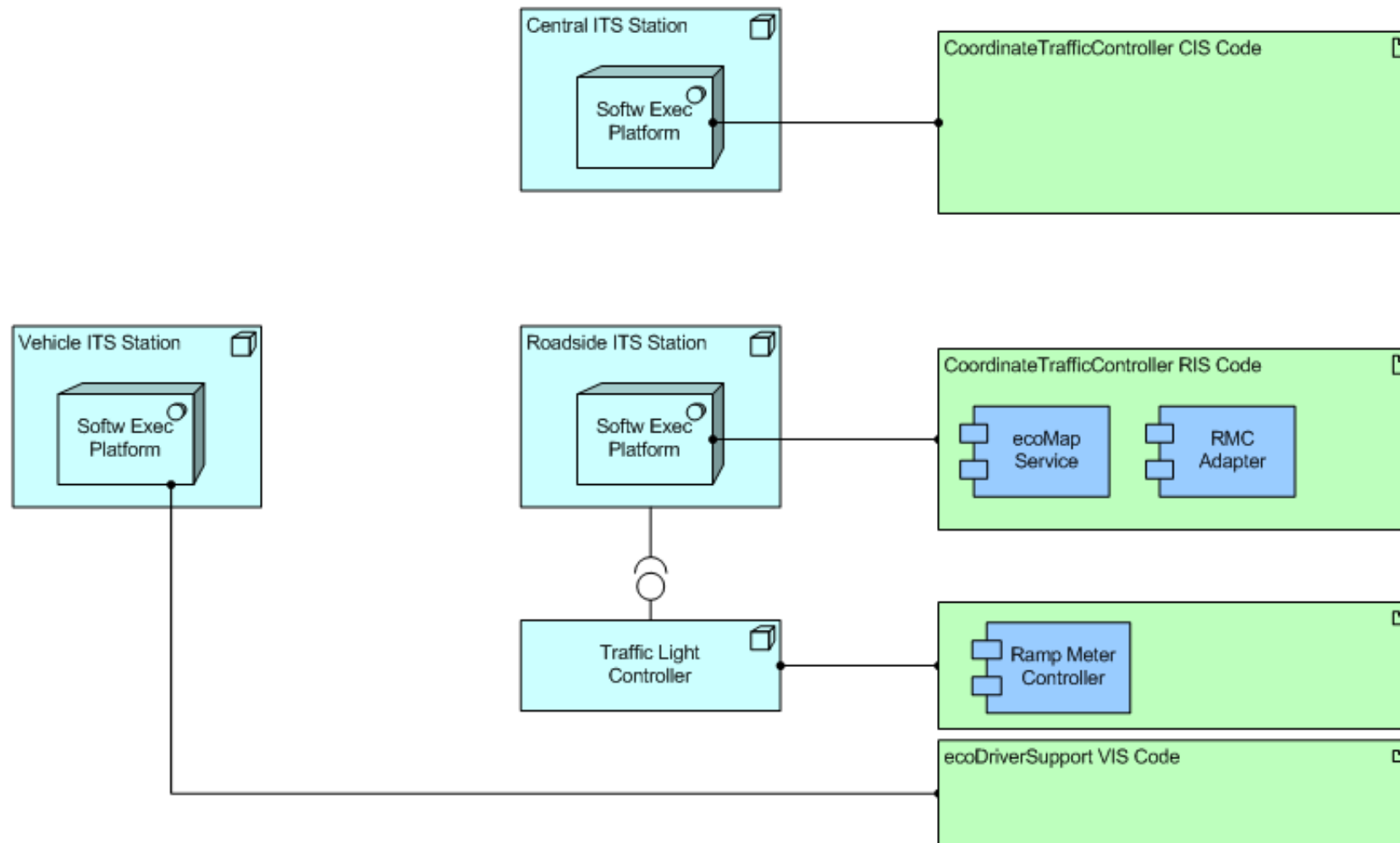
Design Decisions Improve Ramp Control

- All the components of the application are at the road-side.
- The control of the Traffic Light Controller is done by a separate component “RMC Adapter”

Components “Improve Ramp Control”

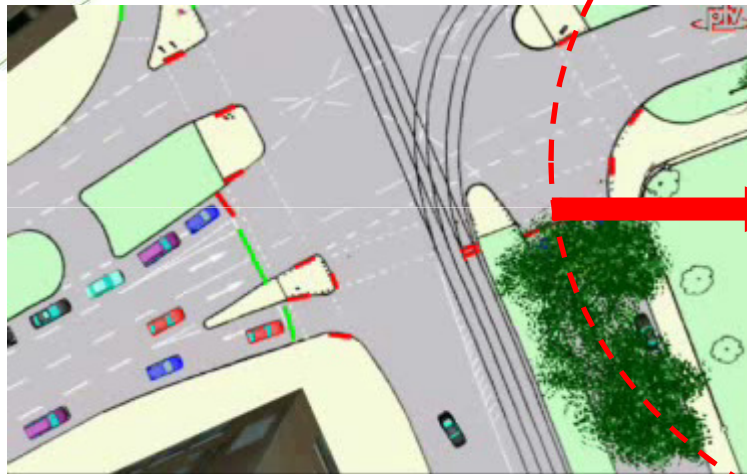


Component RMC Adapter

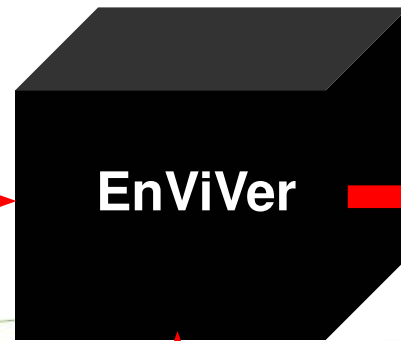


Verification “Improve Ramp Control”

Traffic Micro Simulation
Vissim



Environmental
Vissim
Versit+



Emissions

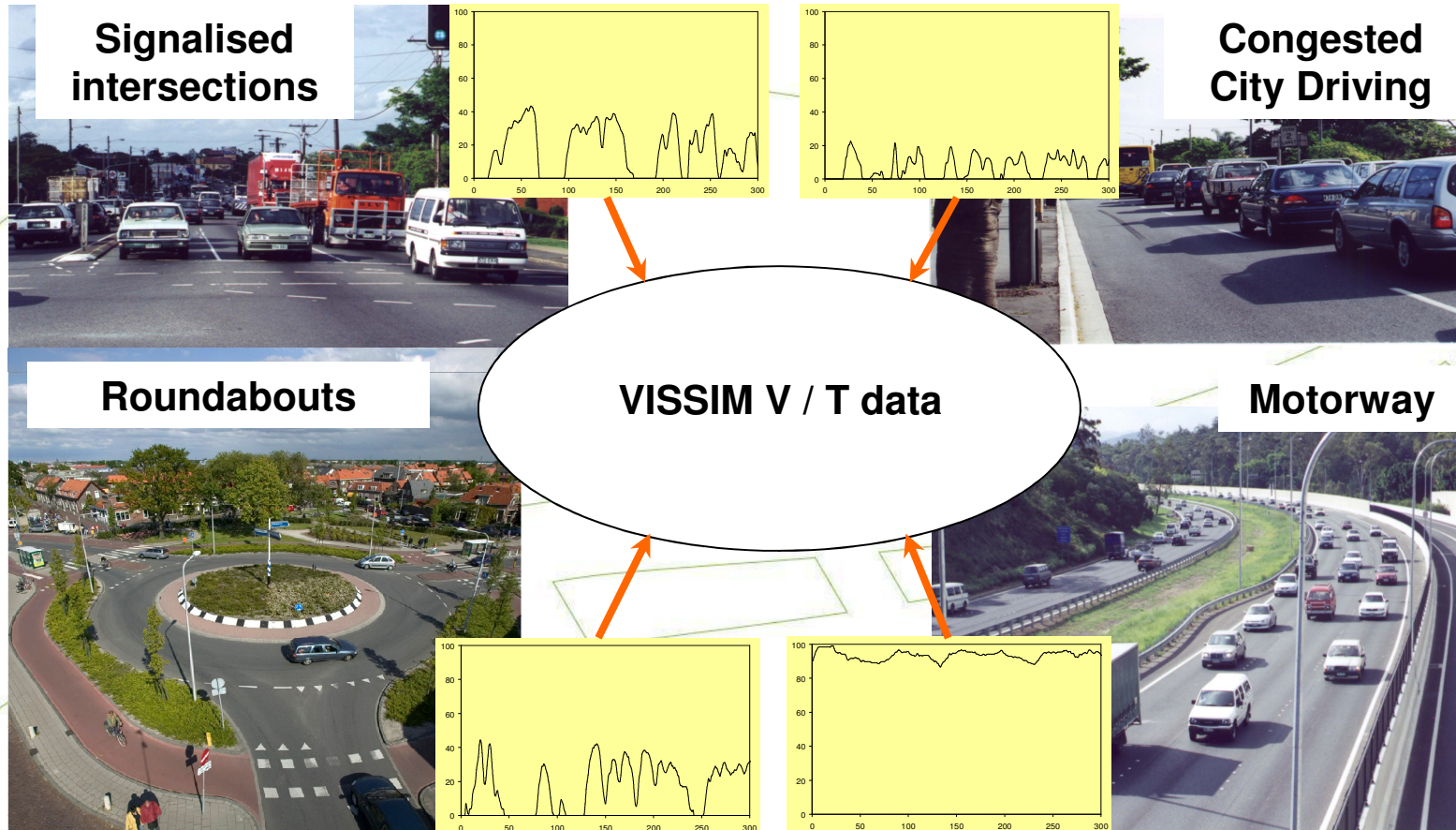
NO_x = XX

PM₁₀ = YY

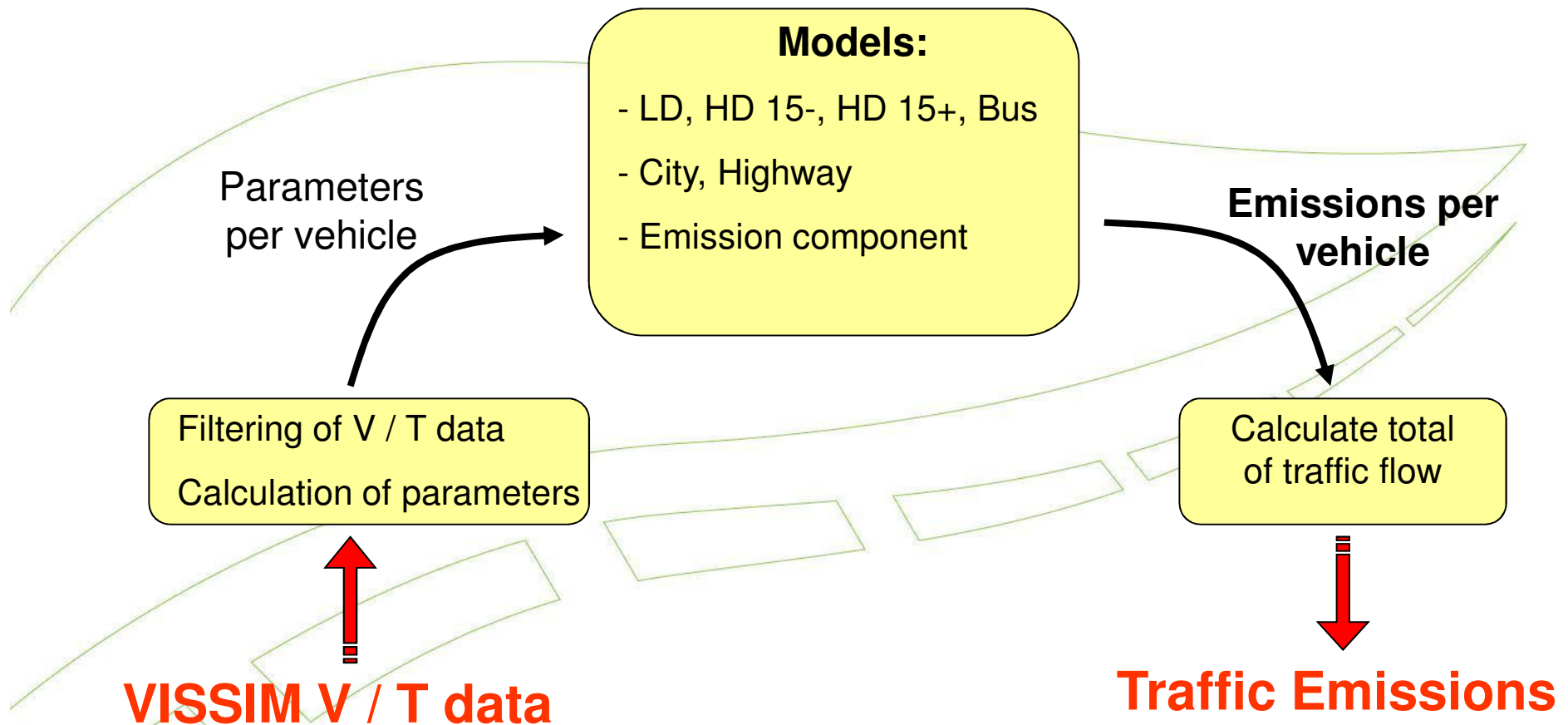
CO₂ = ZZ

Versit+

Traffic condition: Driving patterns

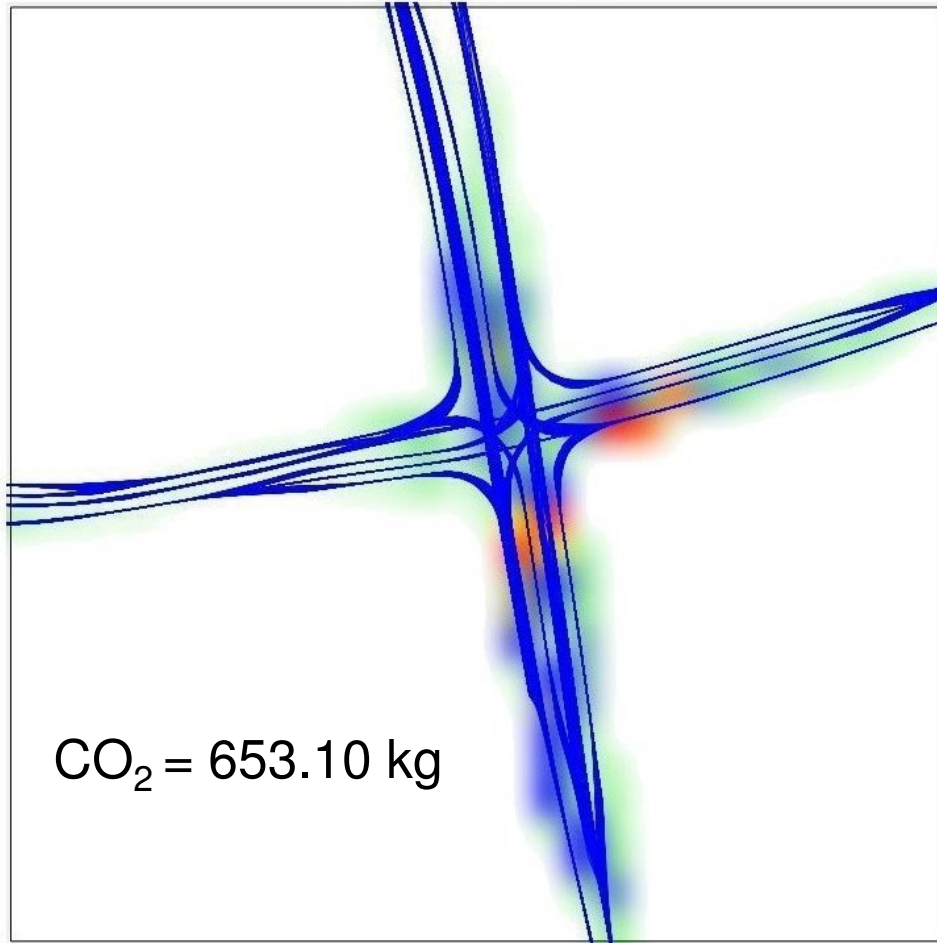


Speed/Time to Traffic Emissions

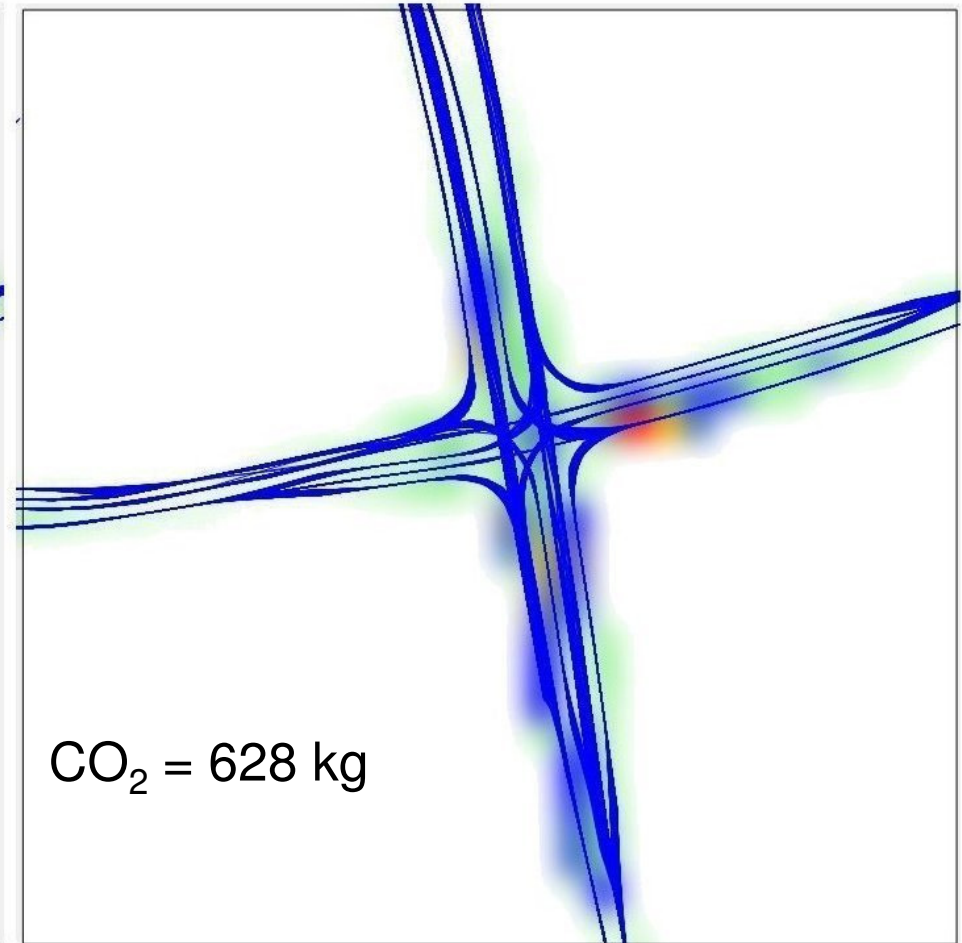


Improved Traffic Light Control

Basic situation



Optimized situation



Requirements “Improve Ramp Control”

Reduction:

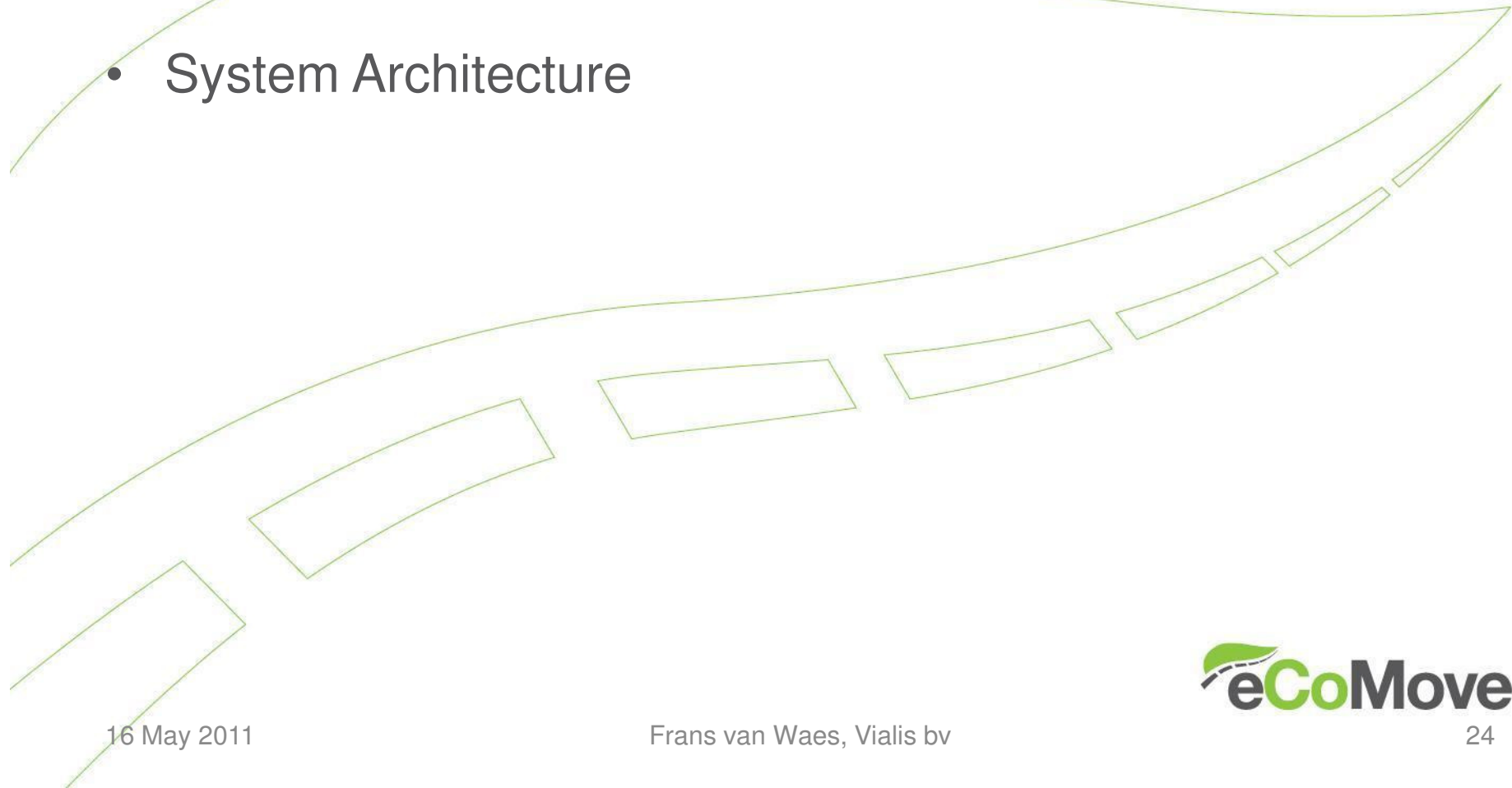
- 10% number of stops
- 10% number of acceleration
- 10% fuel consumption

Based on:

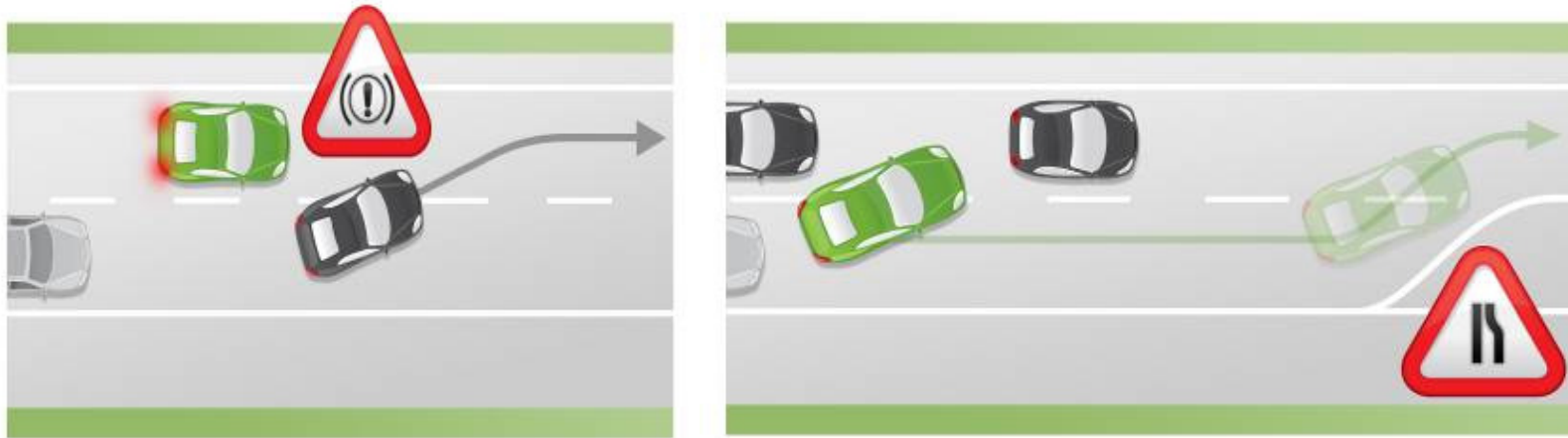
- Experience with traffic light control
- Assumption that cooperative systems contribute the same amount

Support Merging

- Current versus Cooperative situation
- System Architecture



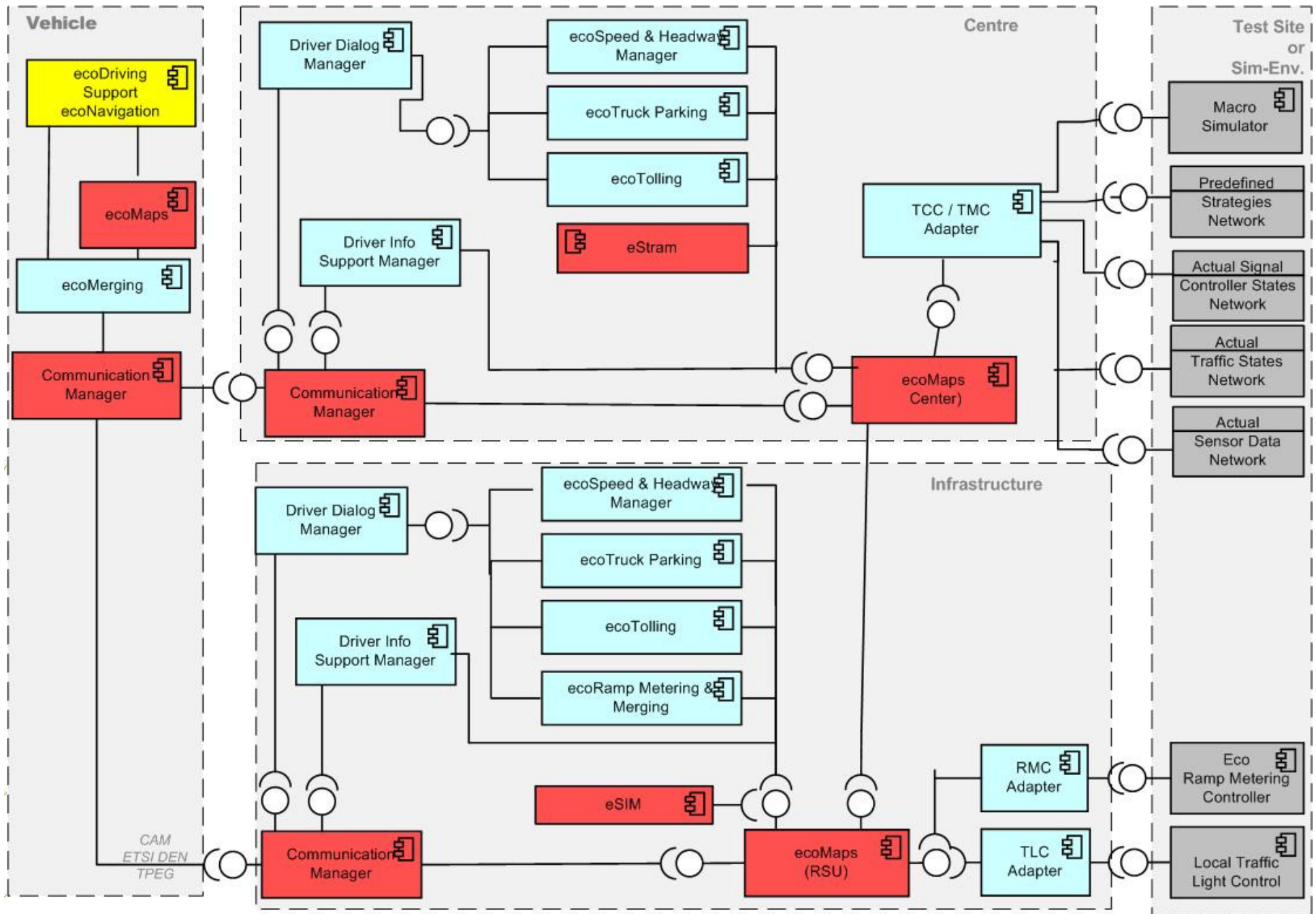
Current versus Cooperative situation



“Support Merging” step by step

- Traffic state
- Estimation of number of lane changes
- Calculation of ideal headways
- Driving advice
- Merging advice





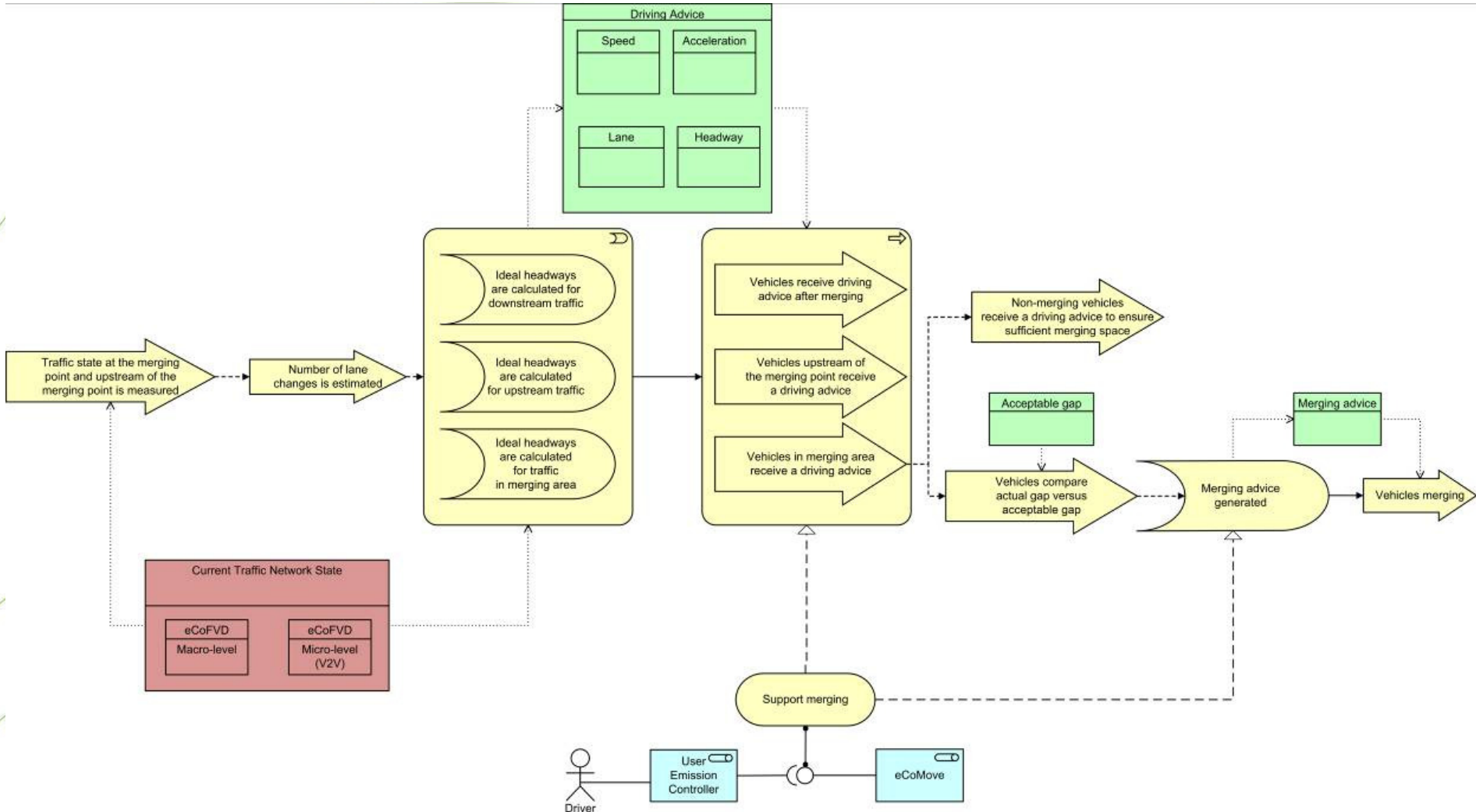
Design Decisions “Support Merging”

- All the components of the application are at the vehicle-side.
- There are no interfaces between the different sub-systems.

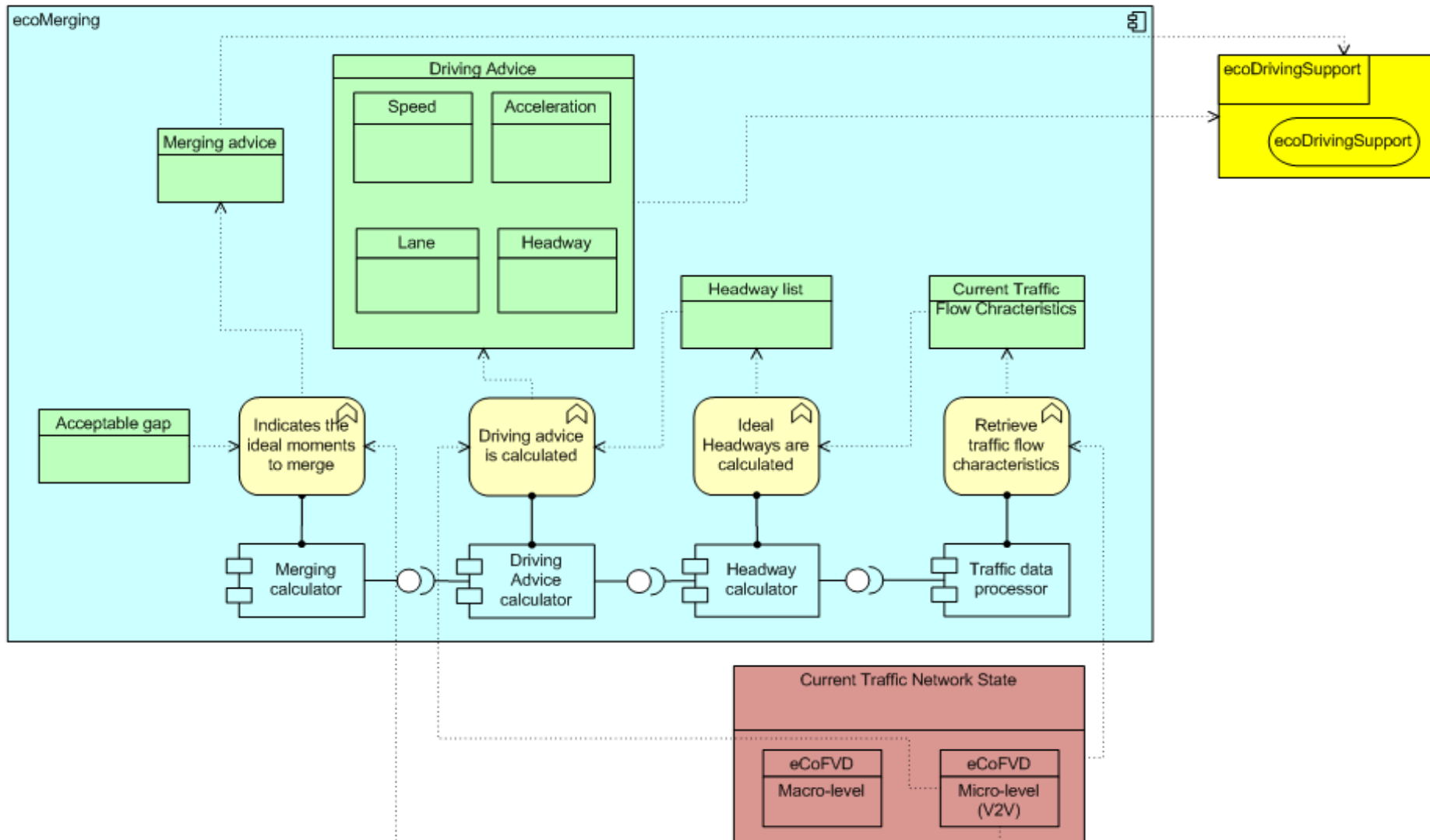
System design “Support Merging”

- Business Layer Diagram to show process flow
- Application Layer Diagram as system design
- Technical Layer Diagram for physical implementation

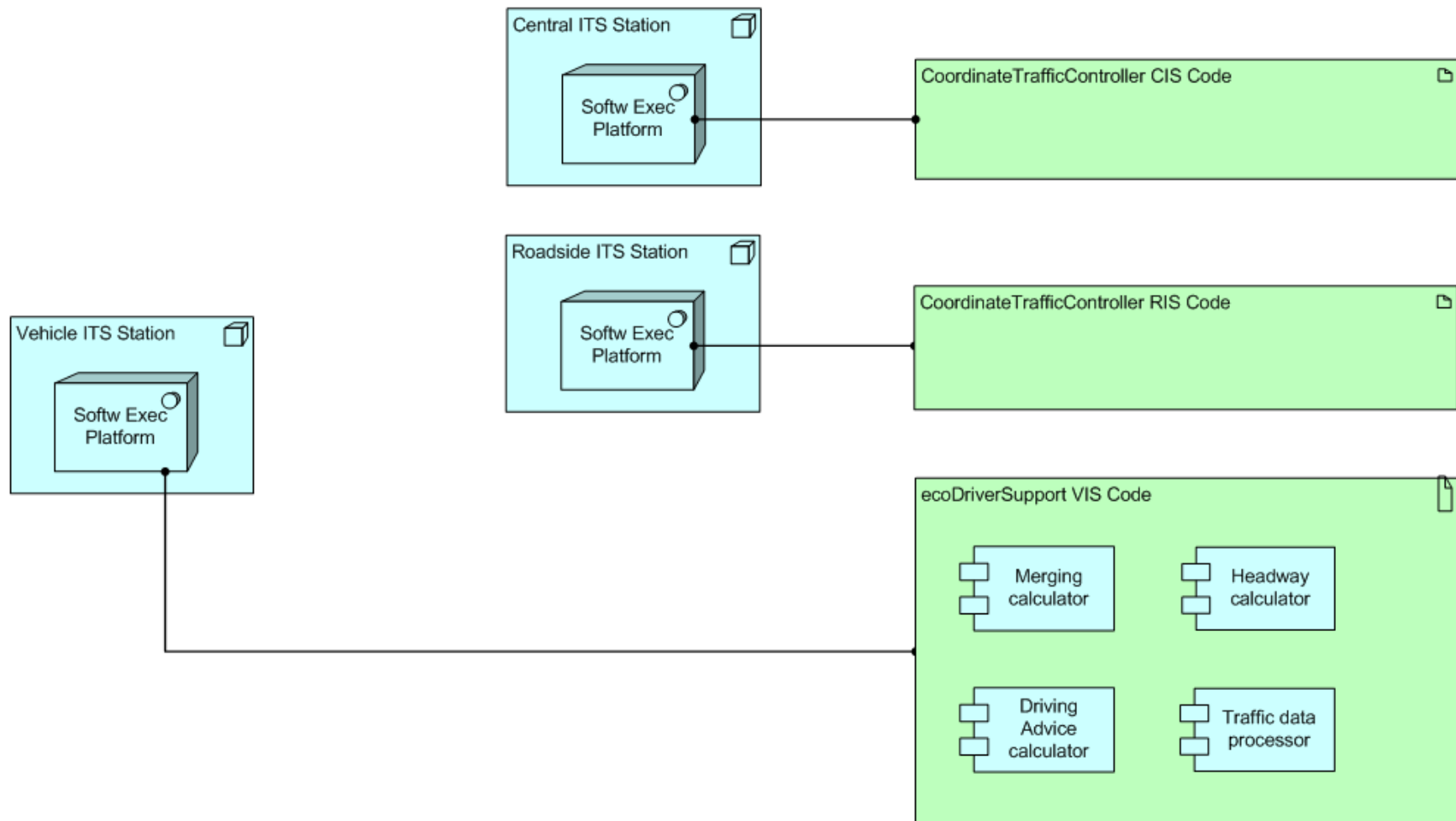
Business Layer “Support Merging”



Application Layer “Support Merging”



Technical Layer “Support Merging”



Conclusions

- One year eCoMove has delivered the specification of several measures.
- Ramp Control and Support Merging are presented as a potential measure to contribute to the eCoMove objectives.
- Support Merging best to implement by Automotive partner.
- Only a field operational test is not yet planned.

Thank you for your attention

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