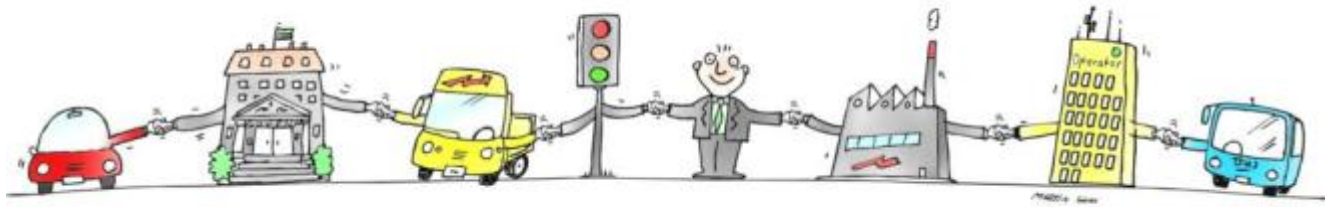
# Navigation, Cooperative Driving and EcoMobility



NAVIGARE 2010, 30.06.2010

*Jean-Charles Pandazis*

# Presentation overview

- » ERTICO and EcoMobility
- » Main steps in vehicle navigation
- » green -ITS, -navigation and -driving
- » Added value of cooperative systems and services
- » eCoMove showing the way
- » Standardisation as key enabler
- » Conclusion

# ERTICO is

- » A platform for multi-sector partnership
- » Advancing R&D and supporting the market introduction of ITS (Intelligent Transport Systems & Services)
- » Fully Partner-driven with organisations from:
  - › Industry
  - › Infrastructure & telecom operators
  - › Public authorities
  - › Users
  - › Others (research institutes, associations)

to promote ITS in Europe

# ERTICO Partners

## Public Authorities

Austria: Federal Ministry for Transport, Innovation & Technology
Belgium: Vlaamse Overheid - Dept. Mobility & Public Works
Czech Republic: Ministry of Industry and Trade
Ministry of Transport
Denmark: North Denmark Region
Danish Road Directorate
Finland: Finnish Transport Agency
France: Ministry of Ecology, Sustainable Development and Spatial Planning
Germany: DLR - German Aerospace Center
Federal Ministry of Transport, Building & Urban Development
WDR- Westdeutscher Rundfunk
Hungary: Ministry of Economy & Transport
Ireland: Department of Transport
Italy: Ministry of Transport
Luxembourg: Administration des Ponts et Chaussées
Norway: Norwegian Public Roads Administration
Poland: Directorate National Roads & Motorways
Portugal: IMTT - Institute for Mobility and Land Transport
EP - Portuguese National Road Authority
Saudi Arabia: Ministry of Transport
Slovak Republic: Ministry of Transport, Posts & Telecommunications
Slovenia: Ministry of Transport
Spain: Basque Government - Department of Transport and Public Works
Dirección General de Tráfico
Directorate - General of Road Transport, Ministry of Internal Development
Sweden: Banverket - Swedish National Rail Admin.
SRA - Swedish Road Administration
**Switzerland :Directorate General of Swiss Customs**
**FEDRO - Swiss Federal Roads Office**
The Netherlands:
Ministry of Transport, Public Works & Water Management
United Kingdom:
DfT - Department for Transport

## Industry

Allianz AG
AVL List
BMW Group
Cobra Automotive Technologies SpA
Continental AG
Denso Europe BV
Efkon AG
Ericsson AB
Fiat Group
Honda Motor Europe
Kapsch TrafficCom AG
Logica
MetaSystem SpA
Mitsubishi Electric Automotive Europe
Mizar Automazione SpA
Navteq
NEC Europe Ltd
Nissan Motor Manufacturing (UK) Ltd - Belgian Branch
NXP Semiconductors
Panasonic Automotive Systems Europe GmbH
Peek Traffic BV
PluService srl
PTV Planung Transport und Verkehr AG
Q-Free ASA
Ramsys
Renault
Robert Bosch GmbH
Satellic Traffic Management (member of T-Systems)
Siemens AG
Technolution BV
Tele Atlas - TomTom
Thetis SpA
Toyota Motor Europe
Vialis
Volkswagen AG
Volvo Car Corporation (representing Ford)
Volvo Technology Corp. (representing Volvo Group)
WirelessCar (representing Volvo Info. Technology)
Ygomi Europe Kft

## Infrastructure Operators

ASFA - Association Professionelle Autoroutes et ouvrages routiers
Egis
Telecom Italia SpA
Vodafone

## Users

ADAC e.V. - Allgemeiner Deutscher Automobil-Club
ANWB - Royal Dutch Touring Club
RACC - Reial Automòbil Club de Catalunya

## Others

ACEA - Association des Constructeurs Européens d'Automobiles
CERTH - Centre for Research and Technology Hellas
CTAG - Automotive Technological Centre of Galicia (Spain)
Dekra e.V. - Deutscher Kraftfahrzeug Ueberwachungsverein
FIA - Fédération International de l'Automobile
ICCS - Institute of Communication and Computer Systems
innovITS
IRU - International Road Transport Union
ISMB - Istituto Superiore Mario Boella
Sintef
Tecnalia
TNO - Traffic and Transport
VDA - German Association of the Automobile Industry
VTT - Technical Research Centre of Finland

# ERTICO vision

## “Intelligent Mobility”

- » Towards zero accidents
- » Towards zero delays
- » With reduced impact on the environment
- » Towards fully informed people
  - › where services are affordable and seamless
  - › privacy is respected and
  - › security is provided

# EcoMobility @ ERTICO

## … with reduced impact on our environment

### Eco-smart driving

- support drivers to adopt and then maintain a fuel-efficient driving behaviour.

### Eco-freight and logistics

- enable freight routing and logistic operations to optimise fuel consumption and green goods transport

### Eco-traffic management

- implement traffic control and management systems improving global traffic network energy efficiency

### Eco-vehicles

- integrate hybrid and electrical vehicles into the transport and energy network

# Main steps in vehicle navigation

1985 autarch navigation

*(ETAK, Travelpilot, Carin, …)*

1990 GPS based navigation

2000 Dynamic navigation *(use of TMC)*

2005 Predictive navigation *(link to ADAS)*

Green routing and navigation

2010 … cooperative navigation

**keywords are prediction & connectivity**

# Green ITS

SafetyForum

## WG on ICT for Clean & Efficient Mobility

Identified measures with greatest potential for environmental benefits:

»Eco-driving support

»Eco-traffic management

»Eco-information and guidance

»Eco-demand and access management

»Eco-mobility services

»Eco-freight and logistics management

»Eco-monitoring and modelling.

... reliable and quantitative estimate of impacts not possible today

"WG believes that all potential Green ITS measures combined could bring reduction of fuel consumption & CO2 emissions of ~25%"

# Green ITS

## Company studies and previous research show that fuel reduction can be achieved from:

»coach & support drivers to drive fuel efficiently

›eco-driving potential: 10-25% (Ecodriven project, 2008)

›eco-driving ADAS support: 15-20% (German Research Initiative INVENT)

»avoiding unnecessary and/or “expensive” miles

›navigation reduces distance travelled: 16% (TNO/TomTom)

›navigation reduces fuel consumption, CO2: 12% (NAVTEQ)

›fuel-optimised navigation: 4% overall, 8% cities (Lund)

# Green ITS

## Main functions for emission reduction

» Eco Routing:

- Economic route calculation based on enhanced map attributes (e.g. curves, slopes, intersections, etc.)
- Optimization by considering vehicle & engine type and driving behaviour

» Predictive Driving:

- Driving recommendations (e.g. for speed, acceleration/brake points/intensity, etc.)
- Predictive gear shift indication for manual gear boxes
- Predictive speed and distance control (ACC & Speed control)

# Green ITS

## First systems and services on the market (1)

» PNDs with eco-routing, now also integrated in vehicles

*e.g. TomTom Portable Navigation Device ™ integrated with the Blue&Me™ platform of FIAT*



*Use limited information to estimate the least fuel consuming route*

*The Eco-Drive information system records and processes data relating to the driving style, and gives the driver with tips for reducing environmental impact and optimising fuel consumption.*

# Green ITS

## First systems and services on the market (2) ...

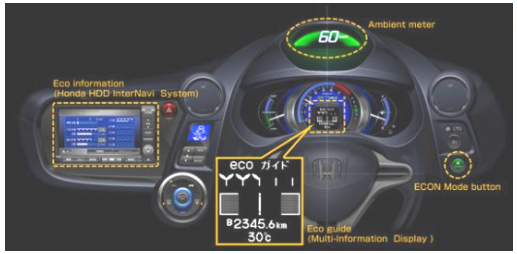
In-vehicle telematics unit for eco-driving support:

» in-vehicle in-built systems, e.g.

- Honda Ecological Drive Assist

» off-line analysis systems, e.g.

- Dynafleet (Volvo Trucks) and Infomax Optifuel (Renault trucks)




All these systems are supporting drivers:

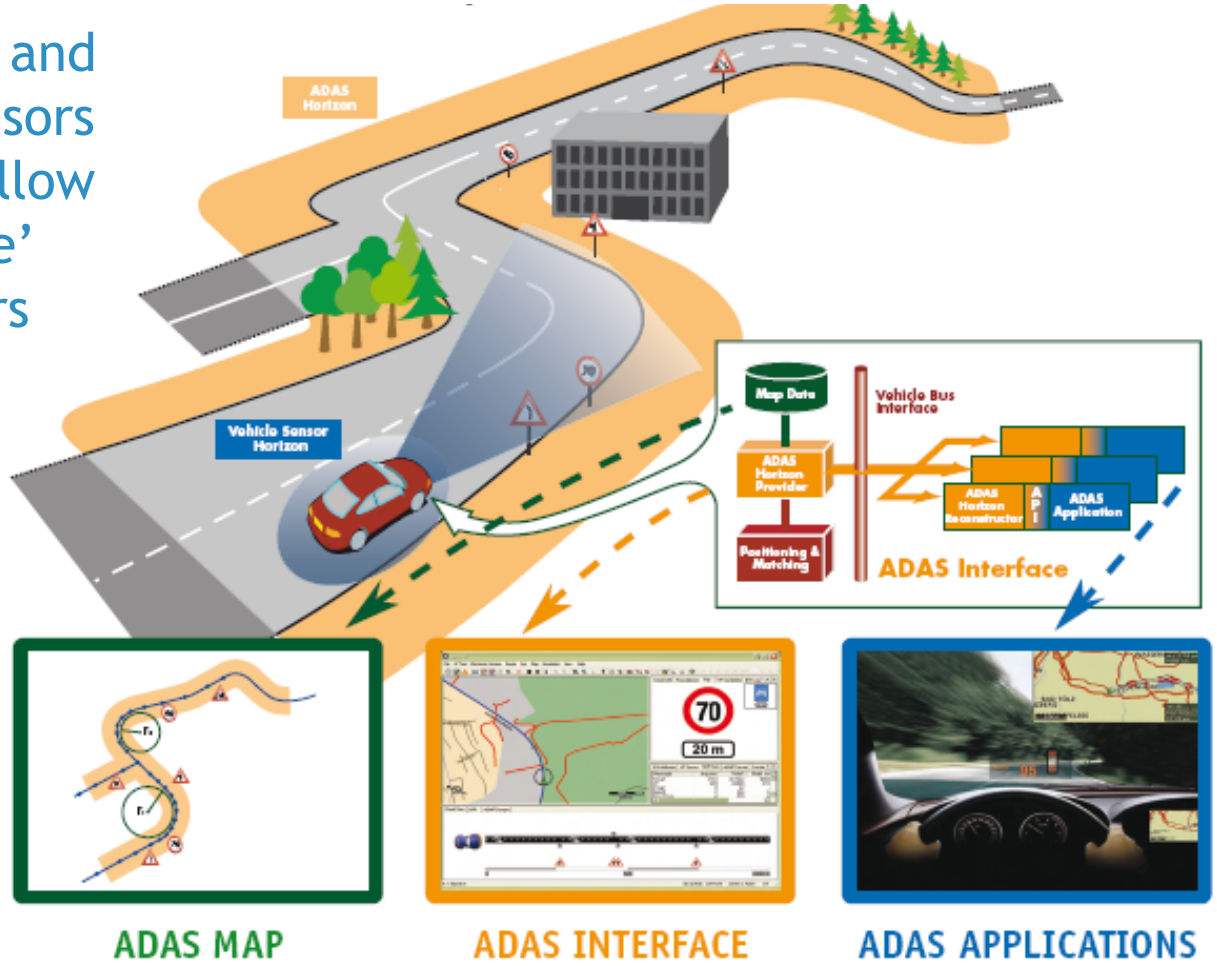
» before trip (Pre-trip planning)

» after trip (Post trip analysis, providing feedback to the driver on his driving behaviour)

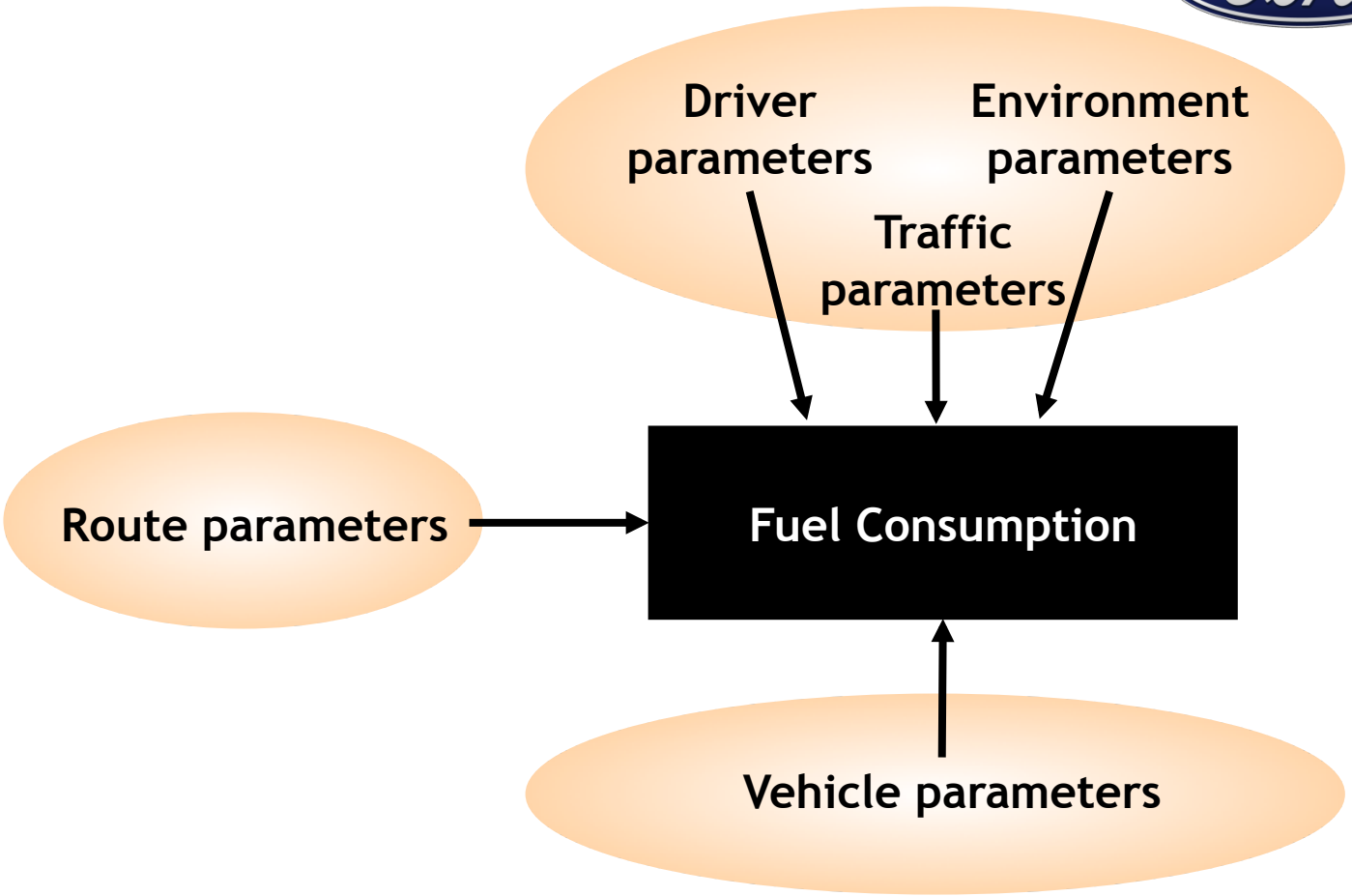
... ITS systems and services mandatory for Electric Vehicles

# Predictive driving:
## The ADAS Horizon Concept

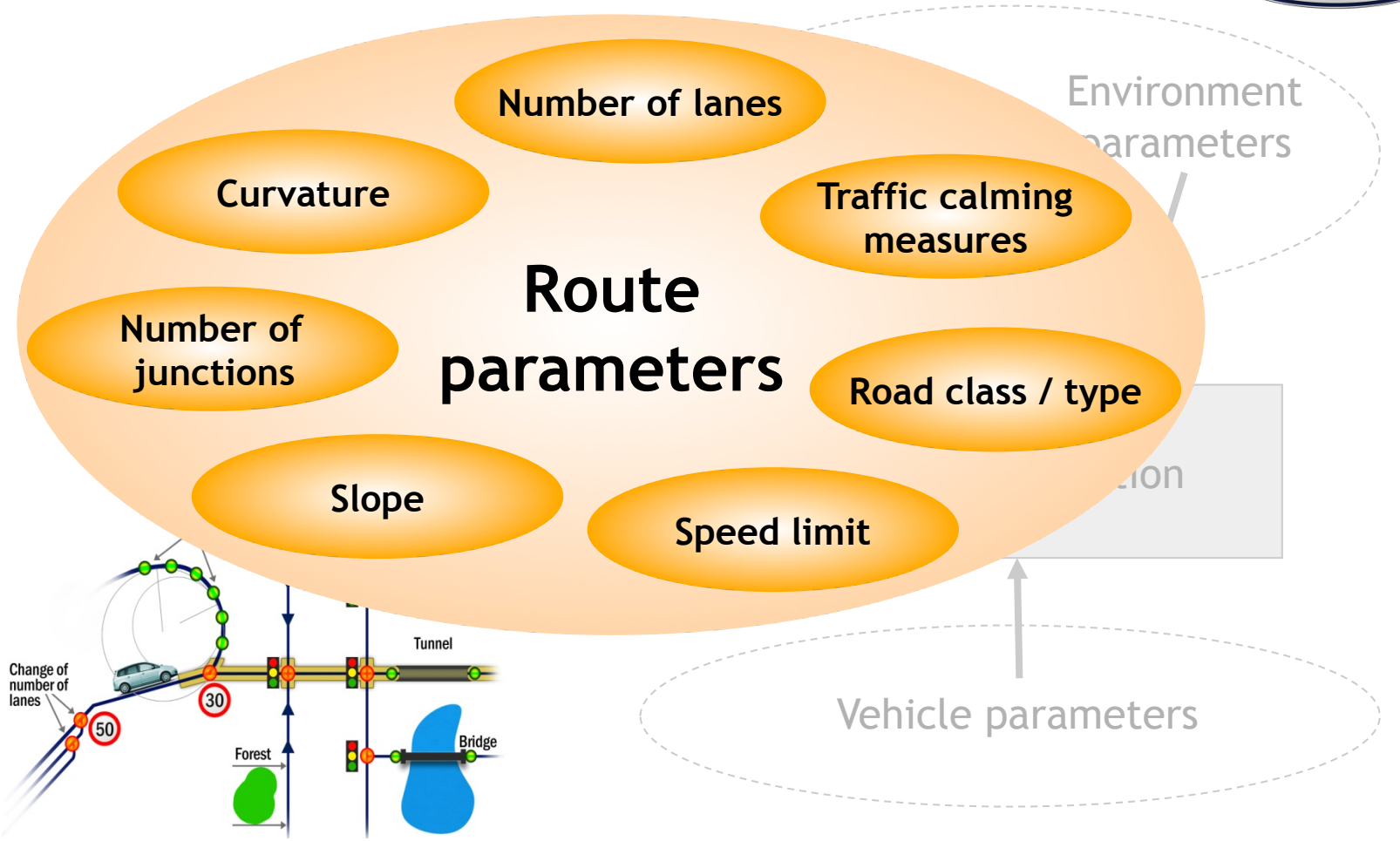
Extend driver and in-vehicle sensors horizon and allow drivers to 'see' around corners



# Application Example: Green Driving



# Green Driving – Digital Map Data



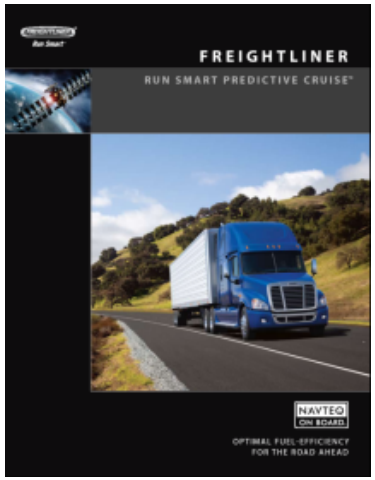
# Application Example – Dynamic Pass Predictor

More Safety and CO2 Reduction with:

› Sensor data fusion w.r. to a Learning Electronic Horizon, an Enhanced Dynamic Pass Predictor, ACC and Car2X Communication

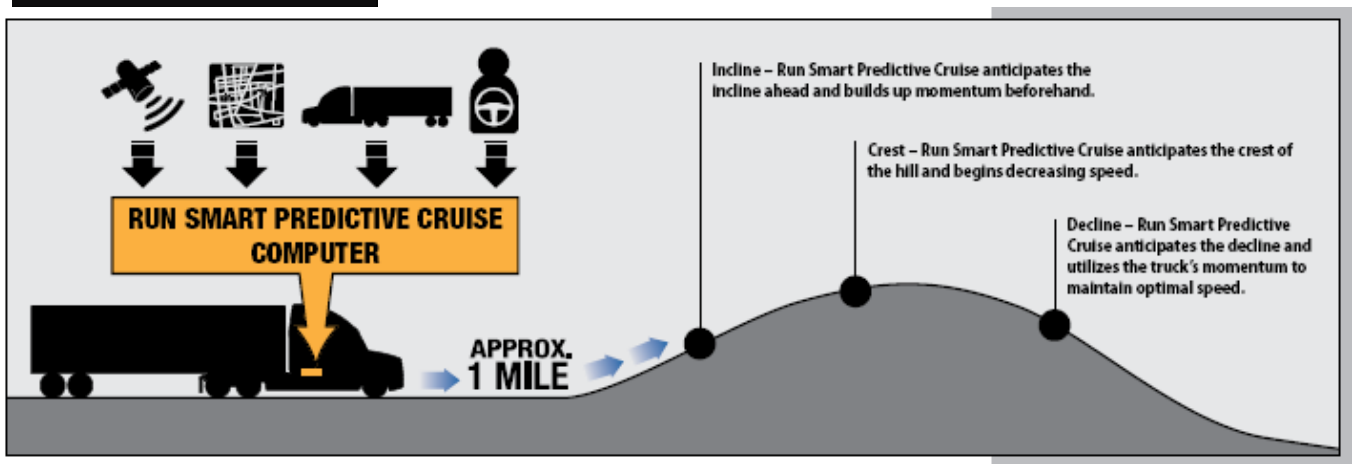
# Application Example:

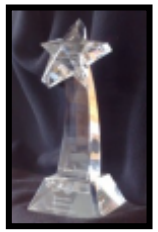
## First Use of Digital Map Data to Enhance Fuel Economy




**Daimler Trucks North America (Freightliner)**
**Run Smart™ Predictive Cruise Control**

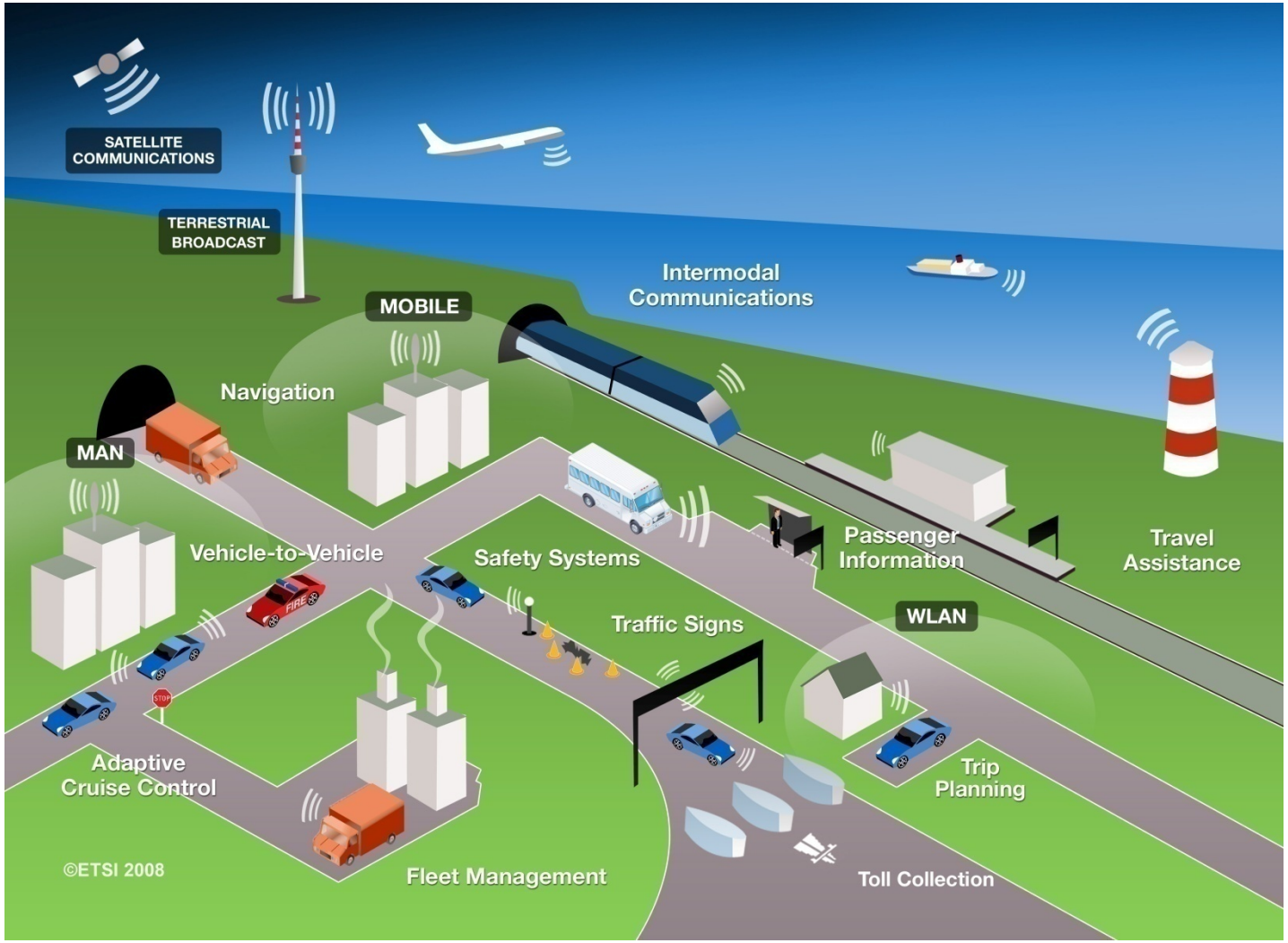
- **Announced March 2009**
- **System anticipates road slope profile 2km ahead**
- **Intelligent speed profile incorporates gravity and momentum in hilly terrain to reduce engine loads**



*Winner, Telematics Update, Best Commercial Telematics Solution, 2009*

# Cooperative Systems and Services
## Overview



# Cooperative Systems and Services

## Added value

Reduce impact on environment & increase mobility by:

»exchanging current status data (V2V, V2I)

»cooperative planning & routing system selecting most economical route for truck, while traffic system optimises traffic lights

»adapting traffic signal parameters and other traffic measures so the ensemble of vehicles in the network consumes as little as possible

*R&D activities:* CVIS, **eCoMove**

*Deployment activities:* Freilot

# Overall objective

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

»drivers sustainably eliminate unnecessary fuel consumption,

»fleet managers to provide incentives to drivers to save fuel, and most economical vehicle management

»road operators manage traffic in the most energy efficient way

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

# Overview

eCoMove
Cooperative Mobility Systems and Services for Energy Efficiency

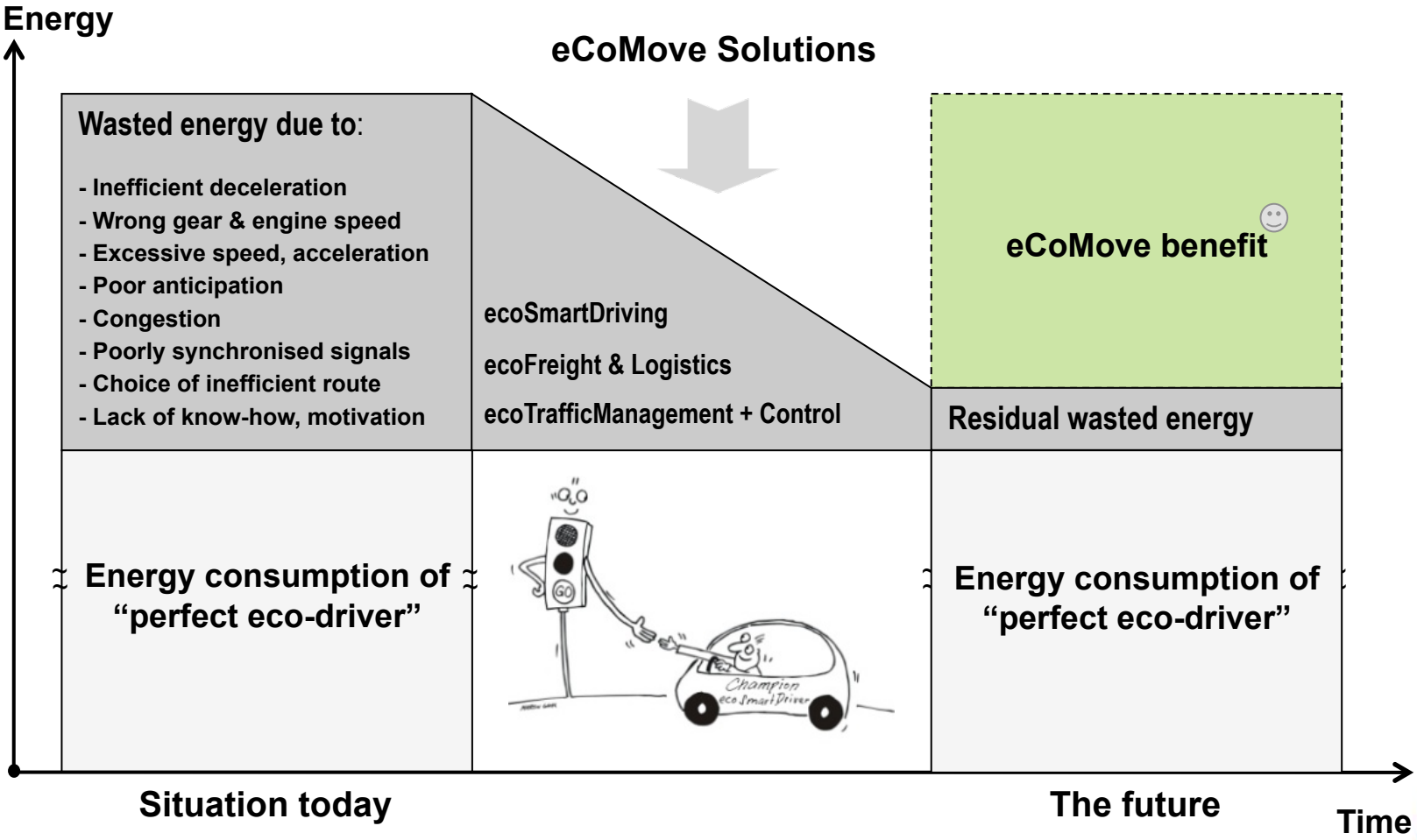
SEVENTH FRAMEWORK PROGRAMME

Consortium:

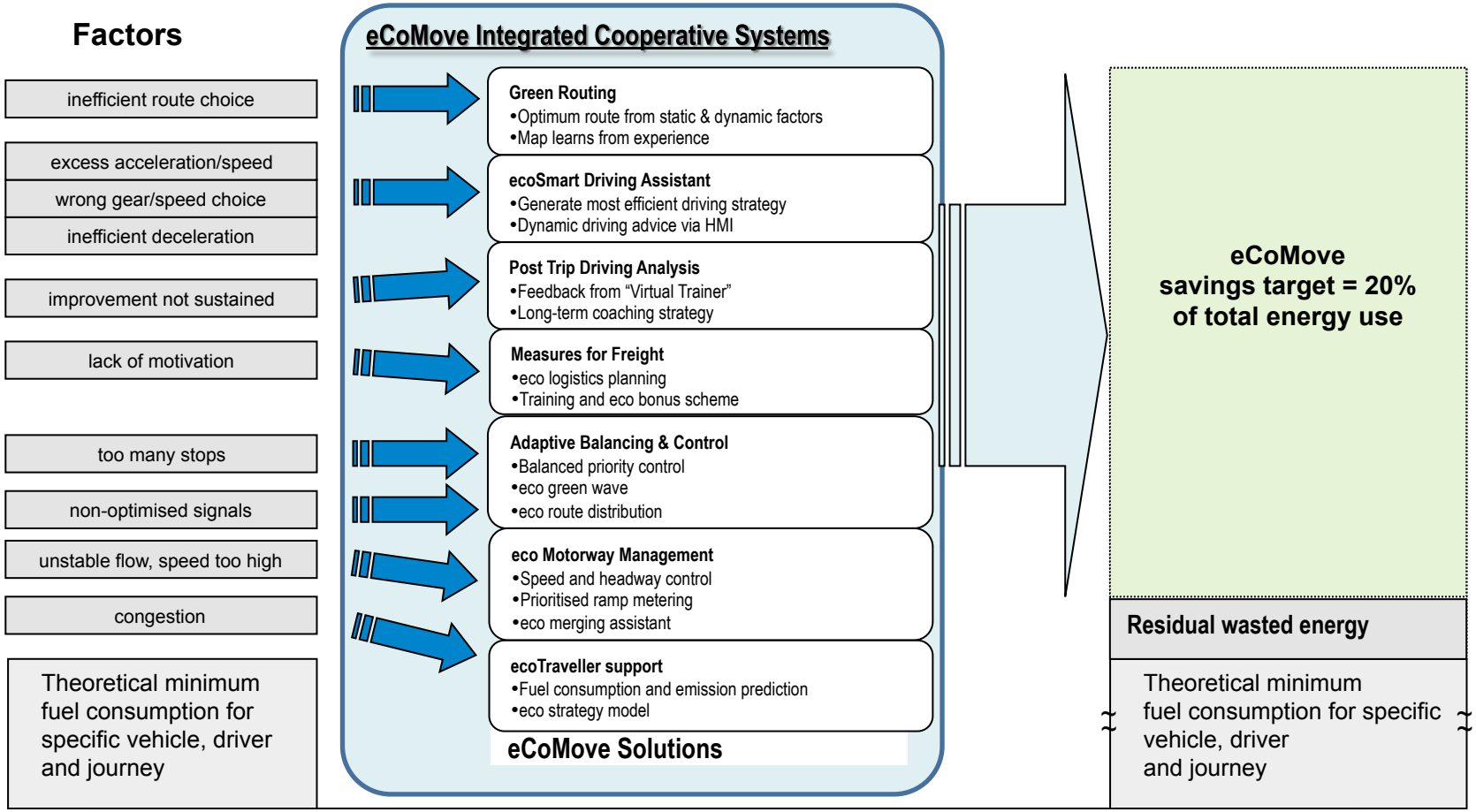
| | | | | | | |
|---|---|---|---|---|---|---|
| ASFA | AVL | BMW | BOSCH Invented for life | cobra | Continental | CRF Centro Ricerche Fiat |
| CTAG | DAF A PACCAR COMPANY | DLR | Ford | GO GREEN trafik & miljö | ika | logica |
| MAGNETI MARELLI | MAT.TRAFFIC | OCTO | NAVTEQ | NEC | PEEK traffic solutions | pTV traffic mobility logistics |
| Q FREE | RACC | robotiker | Technolution | Tele Atlas Find more | TELECOM | TNO |
| TUM | Vialis | VOLVO | | | Coordinator: | ERTICO ITS EUROPE |

» Coordinator: ERTICO ITS Europe
» Total costs: 22.5 M€ EC contribution: 13.7 M€ (DG-INFSO)
» Starting date: 04/2010 Duration 36 Months

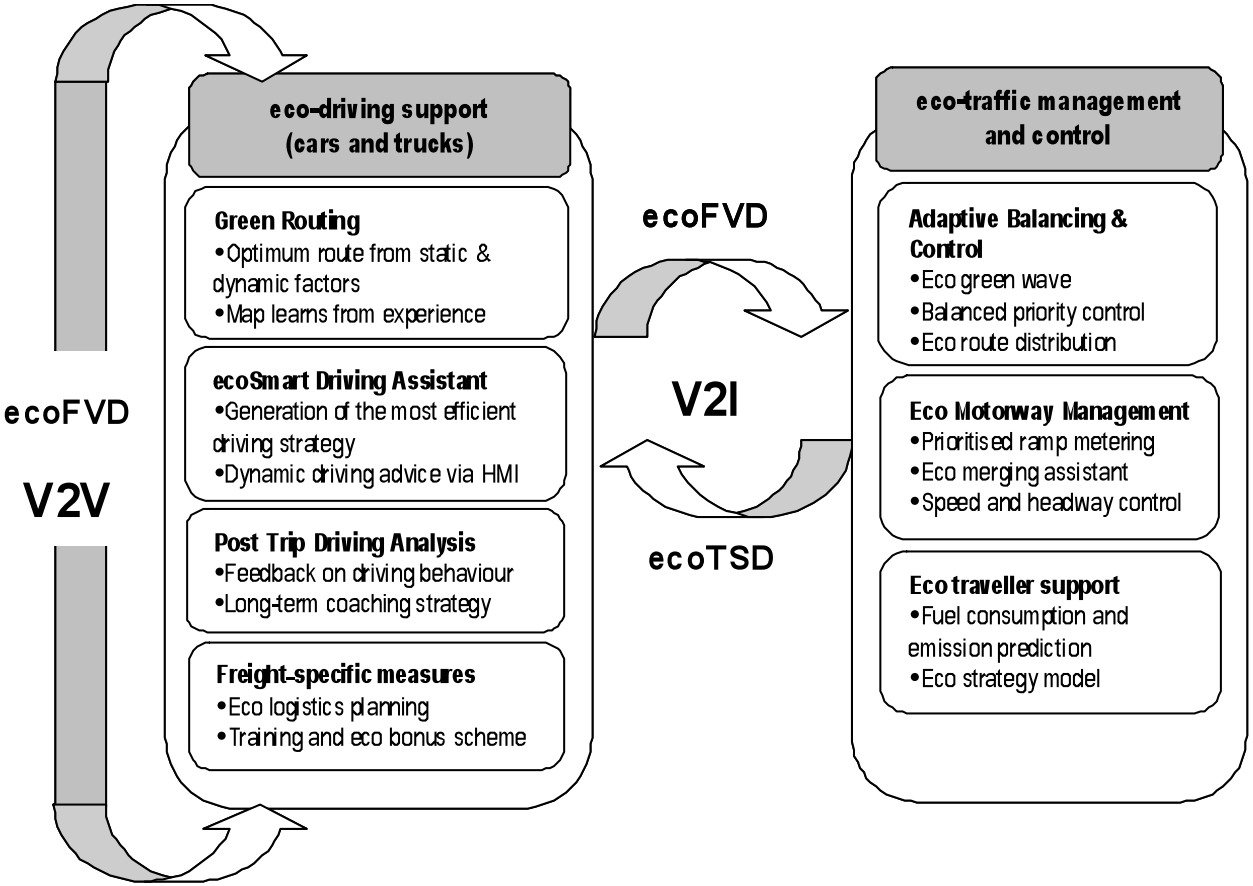
# Vision and motivation



# An integrated Green-Mobility approach



# Cooperative data exchange as enabler

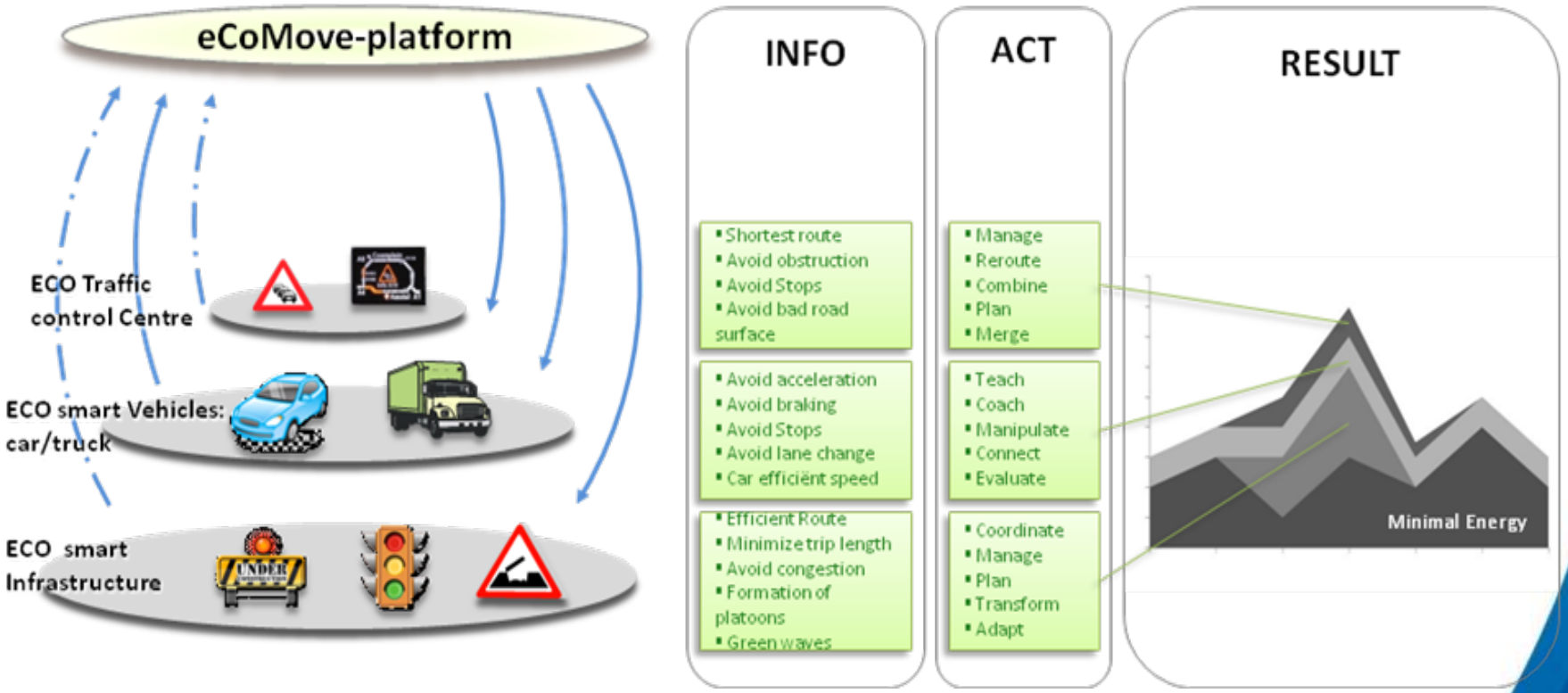



**Key**

| | |
|---|---|
| ecoFVD | eco Floating Vehicle Data |
| ecoTSD | eco Traffic Situation Data |
| V2V | Vehicle-to-vehicle |
| V2I | Vehicle-to-infrastructure |

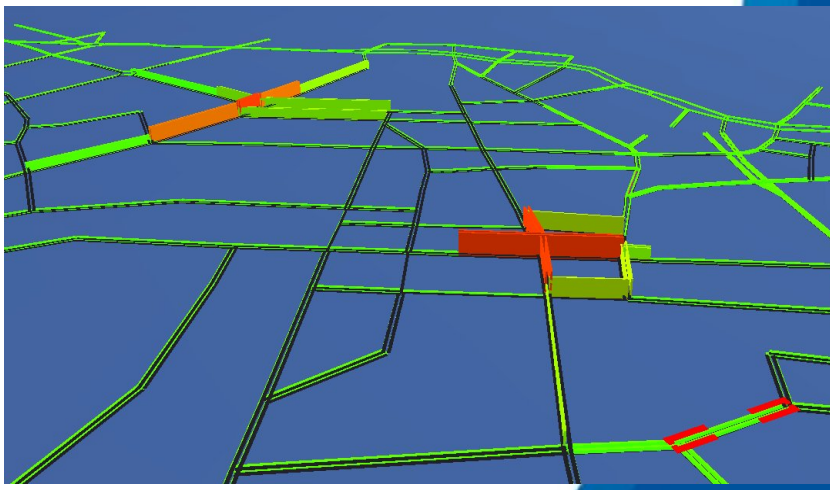
# Overall concept

"Real-time coordination of individual drivers and infrastructure"

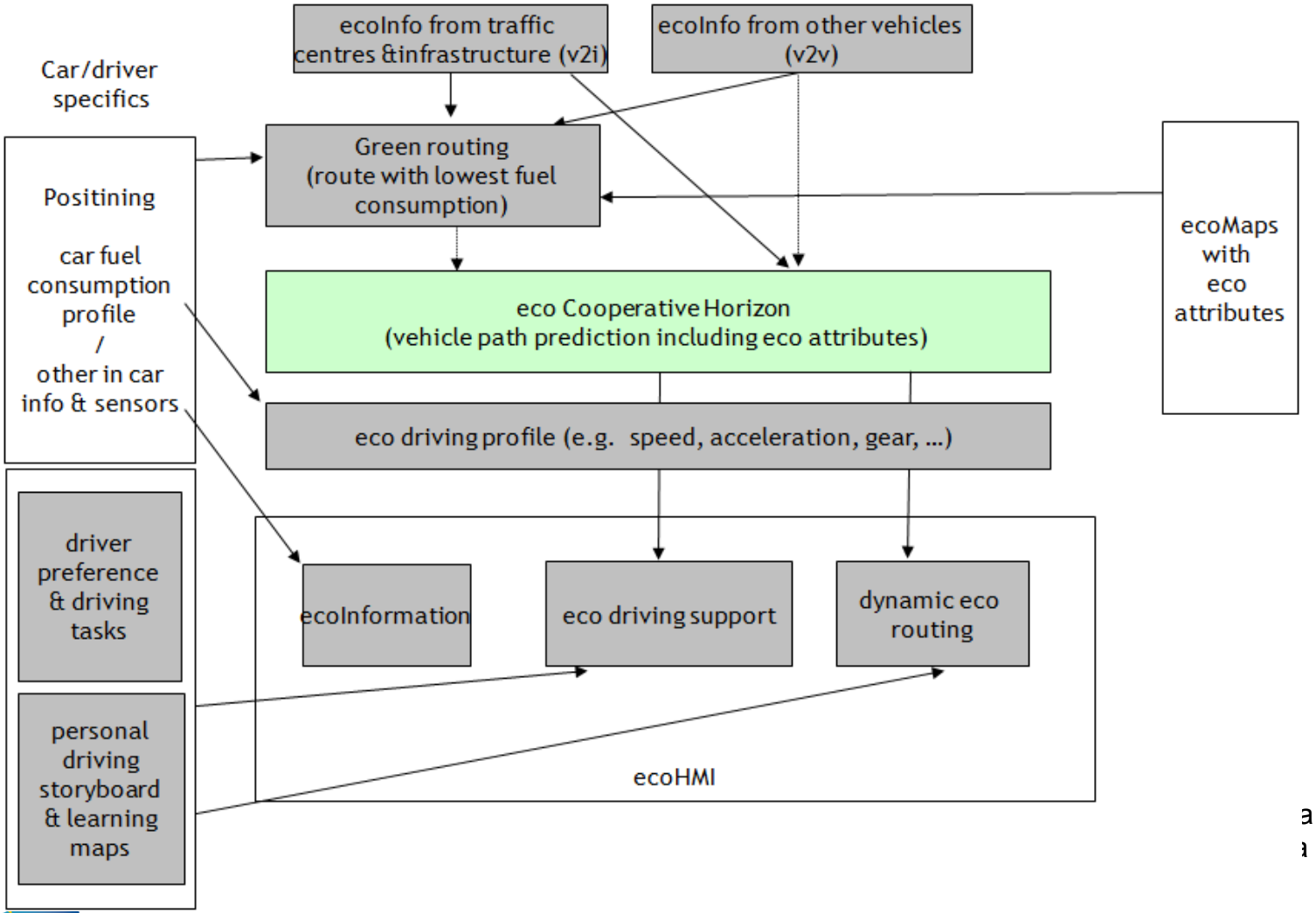


# Core Technologies

- » eCoMove communication platform
- » eCoMove messages
- » An **ecoMAP** comprising a digital map database enhanced with additional attributes needed for eco-driving support, such as slope, historical speed profile and energy consumption data;
- » A **situational operational model** used for eCoDriving support and transport strategy analysis, taking account real area-wide energy use and specific energy "hot-spots".



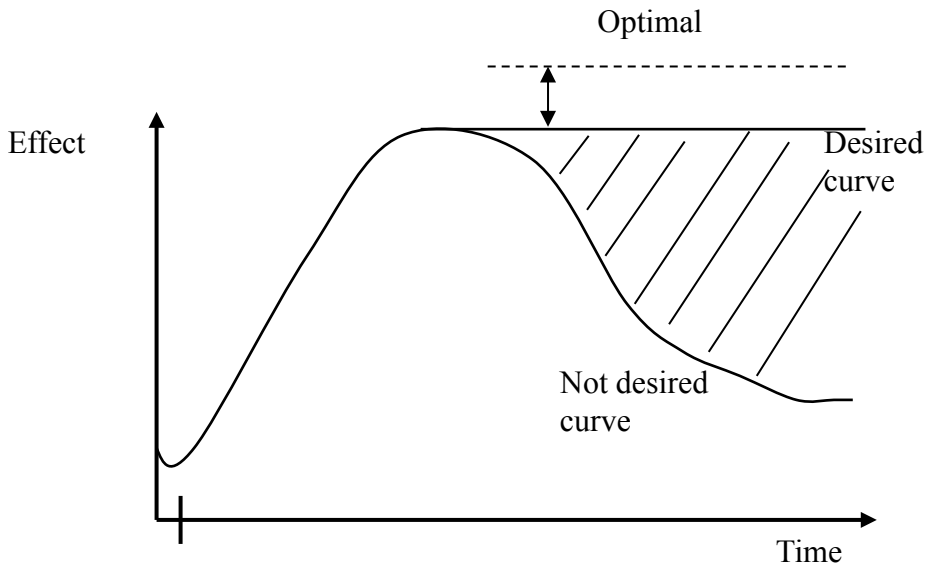
# eCoSmartDriving application overview



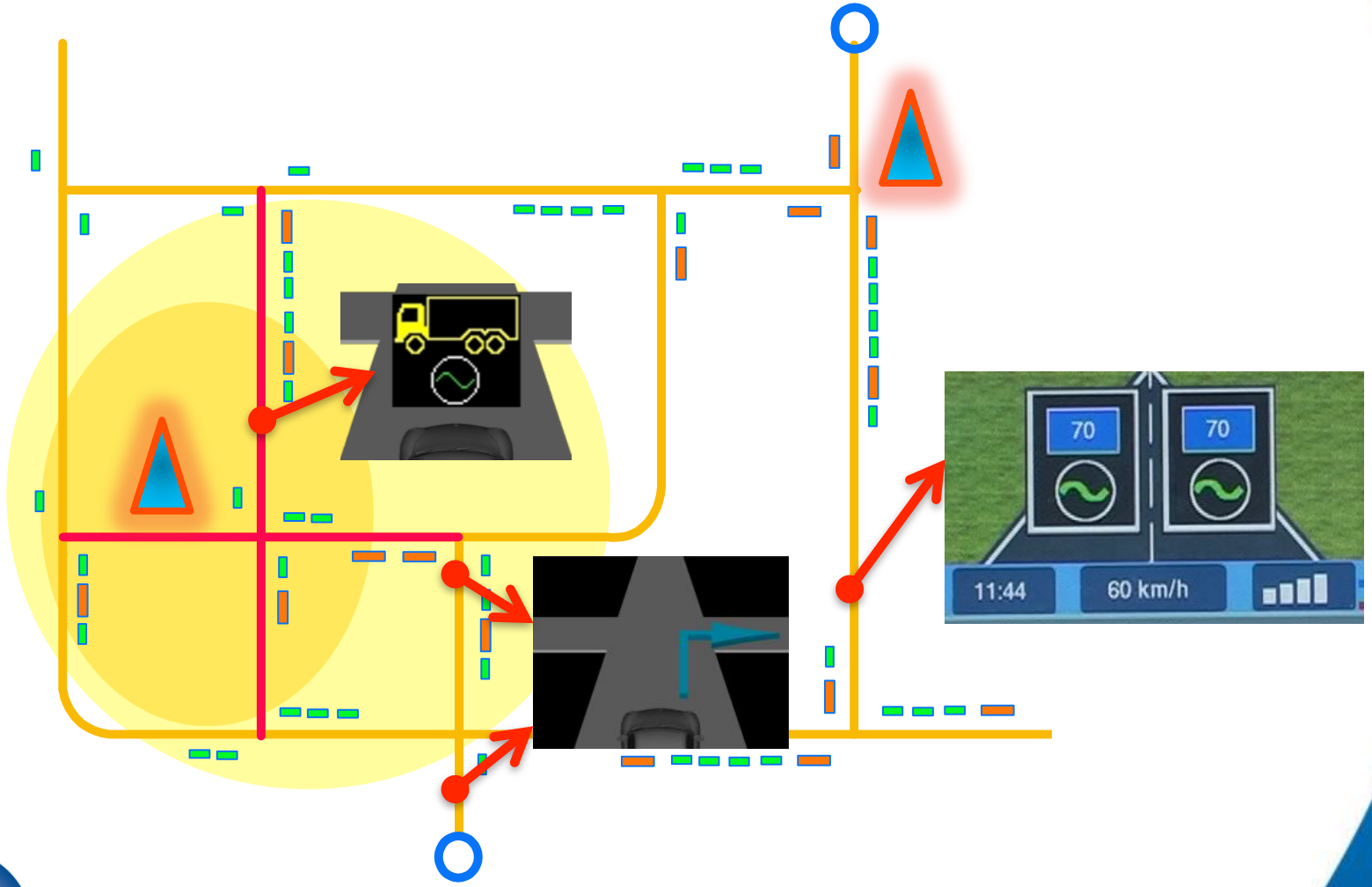
# Eco driving challenges

» Effects of traditional eco driving training wear off over time

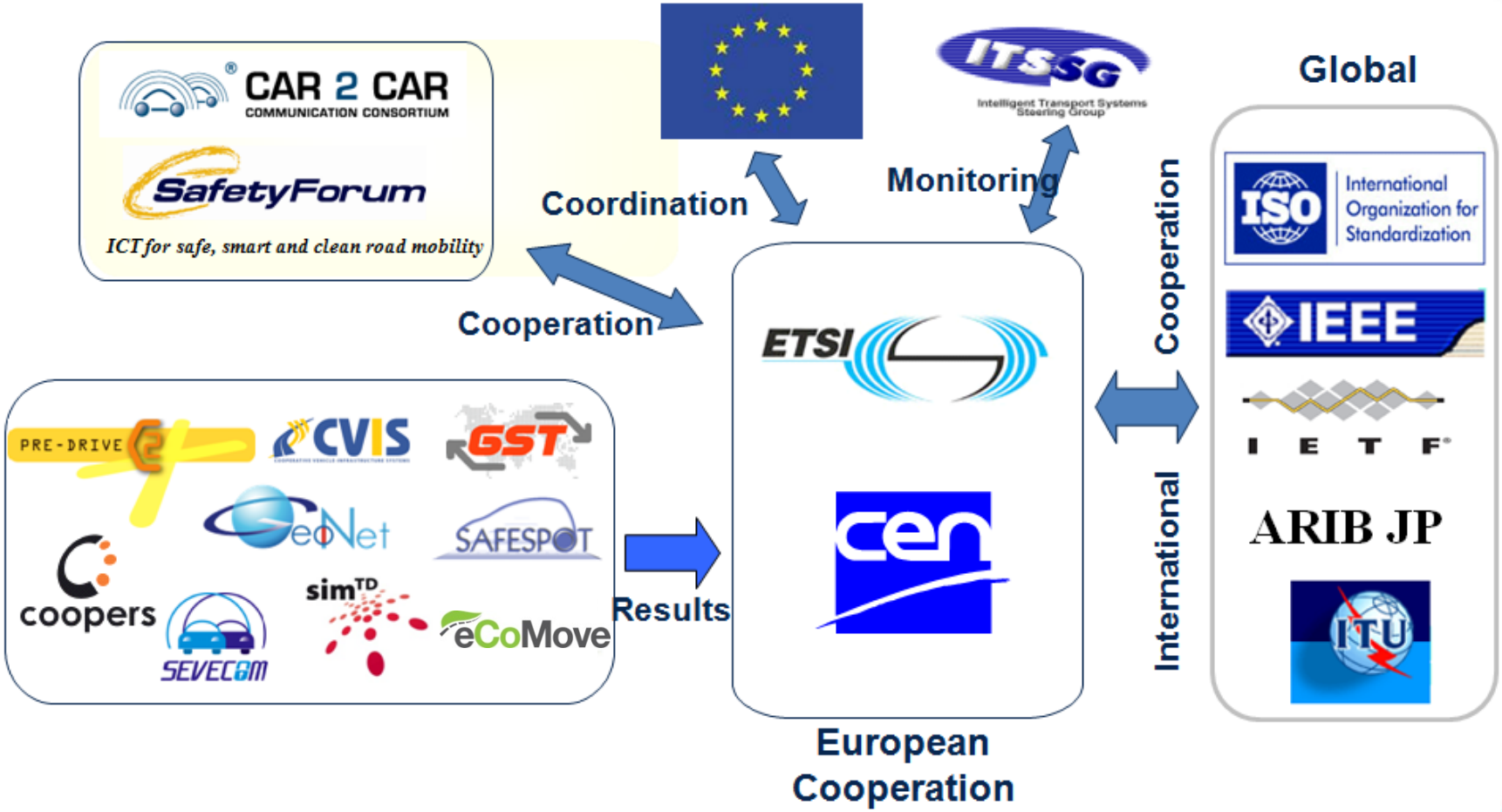
» Sustainable ecoDriving via adaptive coaching and incentives



# ecoAdaptive Balancing and Control



# Standardisation as key enabler



# Conclusion

» Keyword are prediction and connectivity enabling:

› better management of fuel consumption

› more efficient use of transport means

› overall cost reduction

» Realtime driver coaching has the highest potential to reduce fuel consumption

» Cooperative solutions can reduce fuel consumption across road transport

» Core cooperative technology were developed in key projects like CVIS, Safespot and Coopers

# Conclusion

» eCoMove extends these developments to energy efficiency and $CO_2$ reduction with a complete integrated approach based on cooperative technology

These results will directly influence driver behaviour towards eco driving in a sustainable way

**Paradox**

all proposed measures => increase traffic fluidity…

… leading to more vehicles entering traffic …

=> we need to reinvent our mobility

***ITS is the solution***

iMobility

Intelligence into mobility for people and goods across Europe

# Thank you for your attention

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