automotive interiors EXPO 2012

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STYLING AND TECHNOLOGY STUDIO - HMI AT DRIVER'S SUPPORT

FILIPPO CAPPADONA

Stuttgart, 12th of June 2012

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PININFARINA ROOTS

TODAY

Pininfarina Vision

Dressing the Technology

Pininfarina Strategy

Design and Engineering	Sustainable Mobility	Brand Enhancement
Mass production vehicles High end/ Luxury Vehicles Ferrari	Nido EV Blue car Hy-bus Research projects	One off Special Vehicles Brand Licensing Industrial Design

Niche Manufacturing

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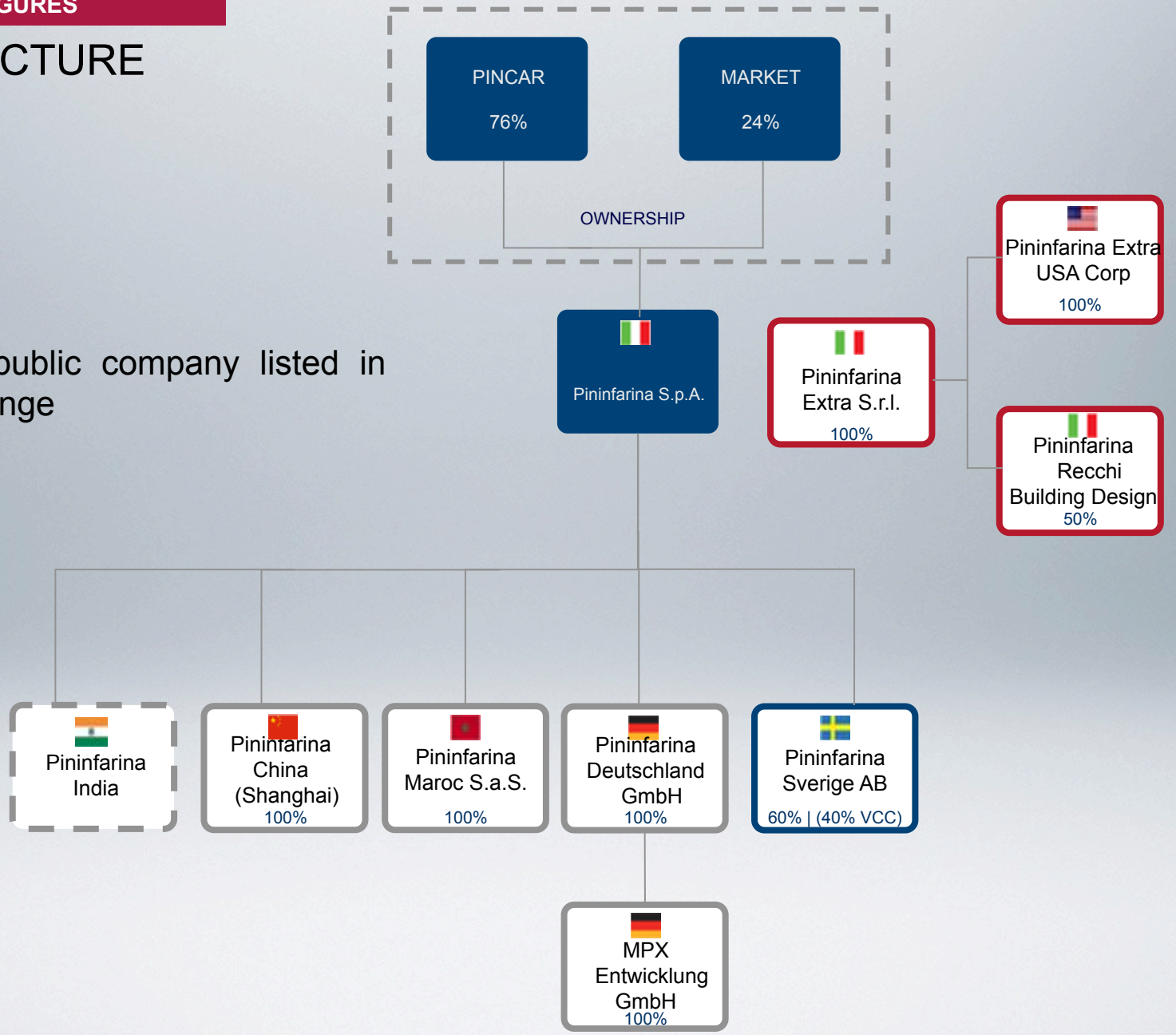
GROUP STRUCTURE

Pininfarina is a public company listed in Milan stock exchange



RESOURCES & INDUSTRIAL TOOLS

850 employees

One Design and Engineering Research Center, two Manufacturing Plants

One state-of – the art Wind Tunnel, Internal Test Facilities and benches

Pininfarina Design and Engineering
Cambiano (Turin, Italy)
Design, product engineering, vehicle integration, modeling and prototyping

Pininfarina Manufacturing
San Giorgio Canavese (Turin, Italy)
Trim and final assembly shop, test track and final tuning,

Pininfarina Manufacturing
Bairo Canavese (Turin, Italy)
Trim and final assembly shop, test track and final tuning,

Wind Tunnel
Grugliasco (Turin, Italy)
Aerodynamic and Aero-acoustic Research Center

Internal Test Labs
Cambiano (Turin, Italy)
Body stiffness, Modal Analysis, Climatic Chambers, other benches

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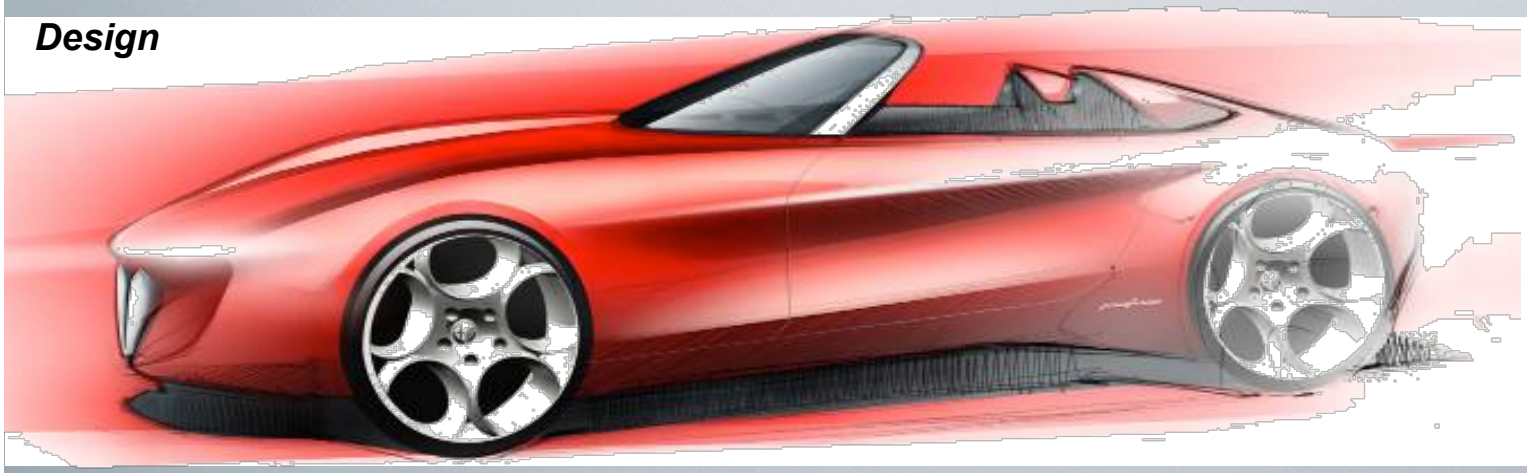
FULL SERVICE PROVIDER

Design



pininfarina CONSULTING

Industrial Consultancy

Engineering

Niche Manufacturing

Industrial Design

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PRODUCT DEFINITION/PORTFOLIO

Supercars

Mass Production Vehicles

Show Cars

Fast Growing Markets

Industrial Vehicles & Railways

Sustainable Mobility

PININFARINA's

design approach is characterized by

Innovation, functionality and aesthetic coherence

which reflect the brand values
in terms of
harmony, progress and luxury

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PININFARINA ETHOS (1994)

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PININFARINA ETA-BETA (1996)

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PININFARINA METROCUBO (1999)

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PININFARINA NIDO(2004)

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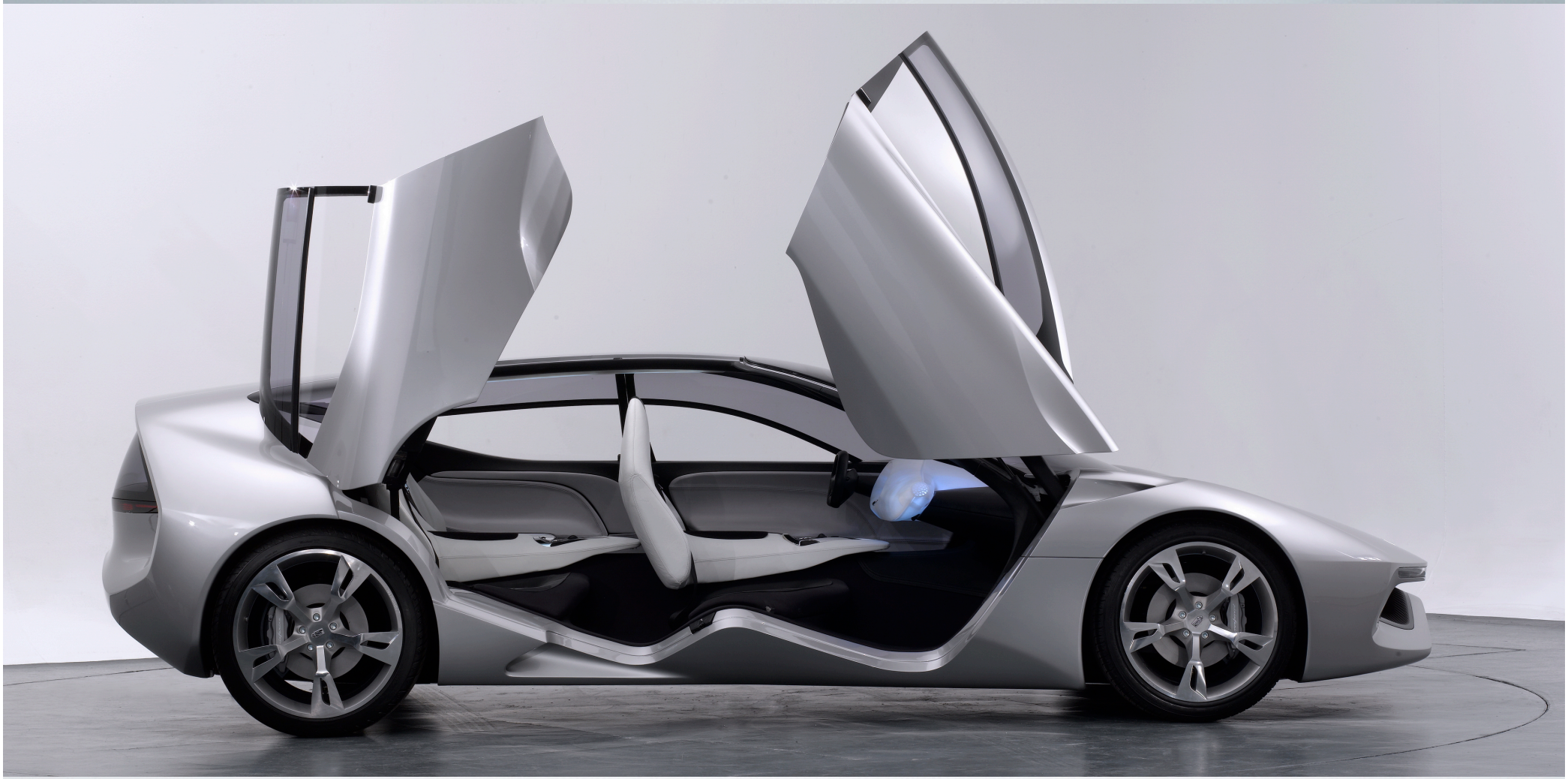

PININFARINA SINTESI (2008)

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PIINFARINA - BOLLORÉ BLUE CAR (2008)

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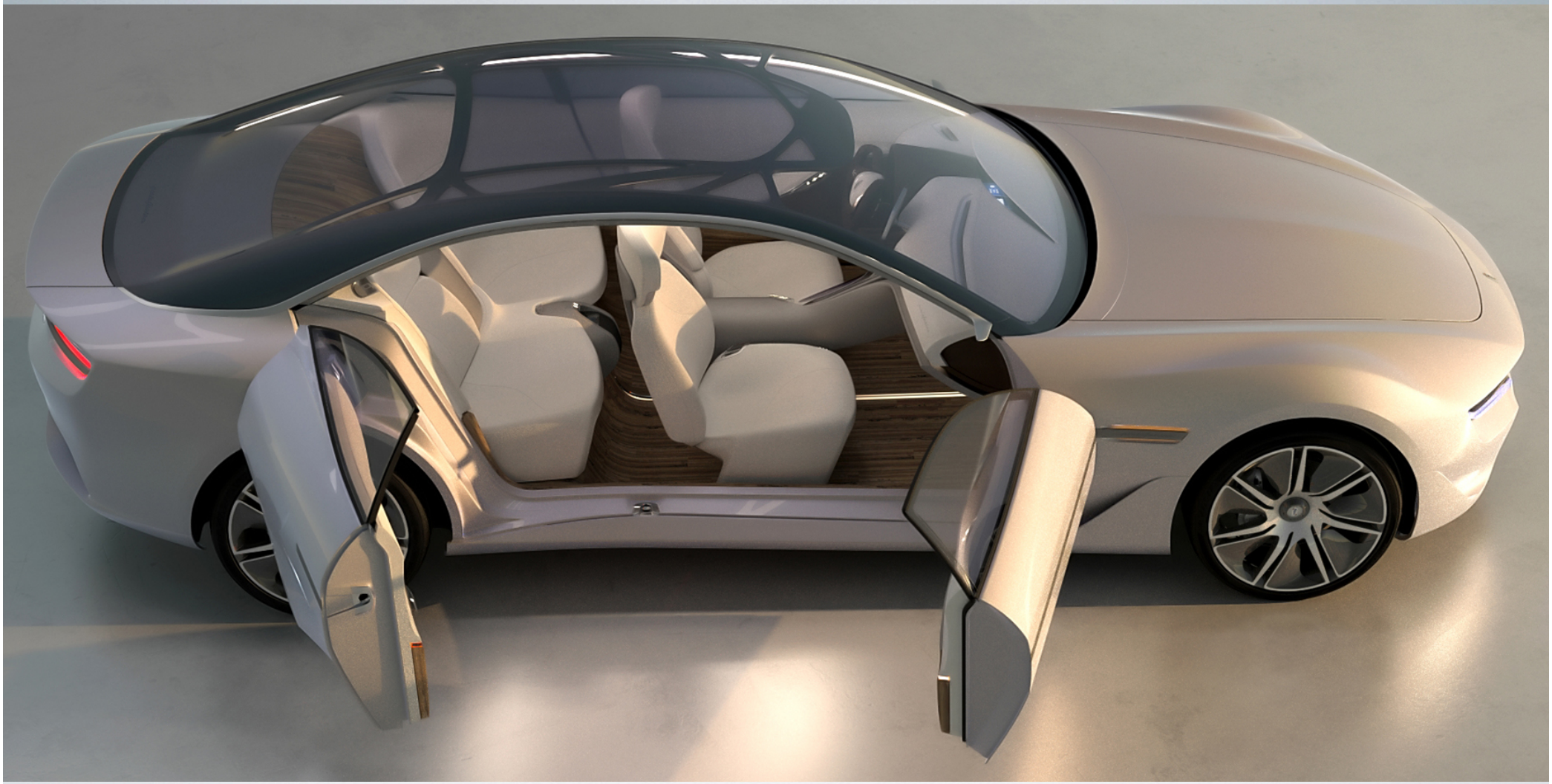

PININFARINA CAMBIANO (2012)

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TRAM SIRIO PROGRAM

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TALGO AVRIL

EUROSTAR REFURBISHMENT

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SUSTAINABLE MOBILITY

PININFARINA HYBUS PROGRAM

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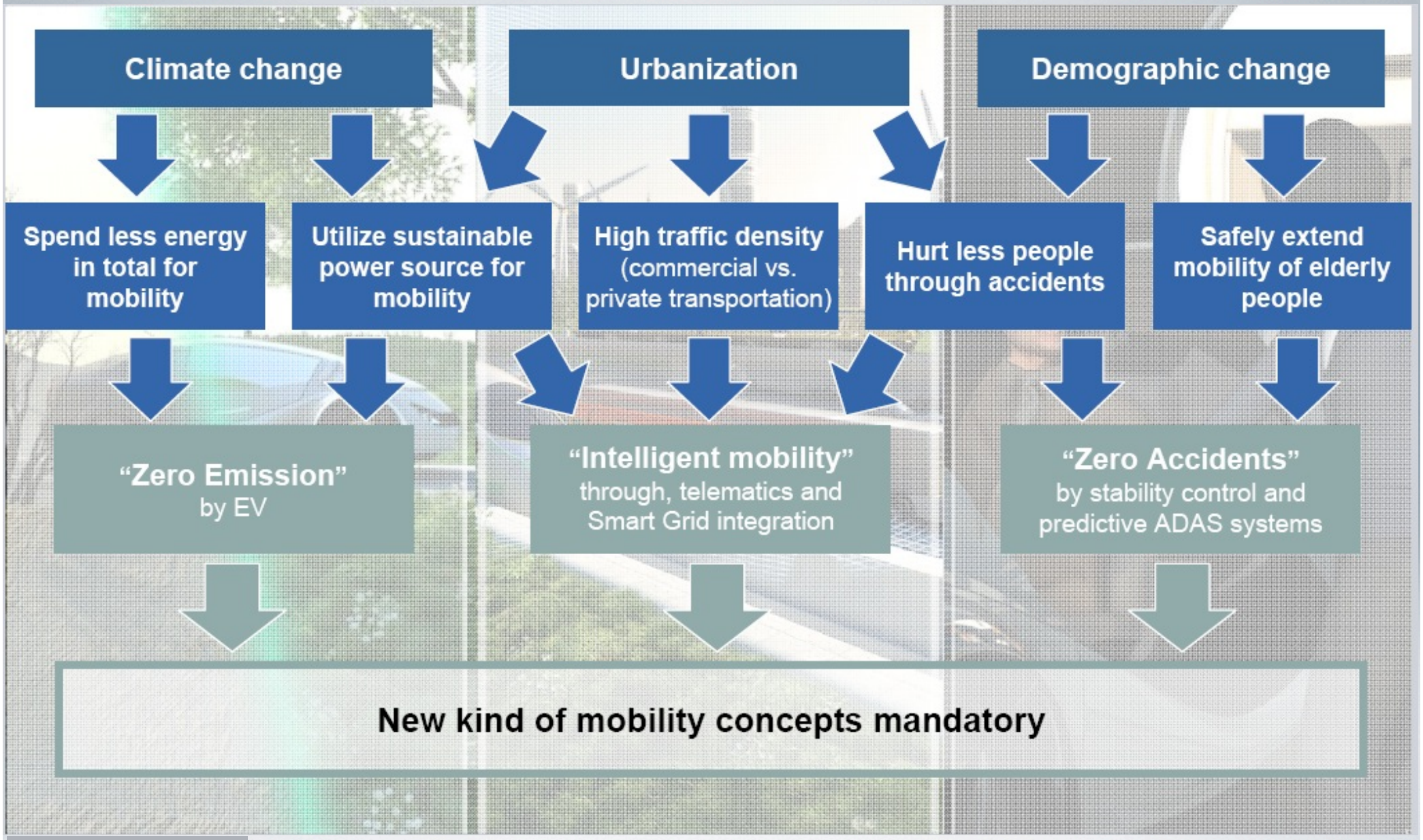
NOVEL MOBILITY CONCEPT



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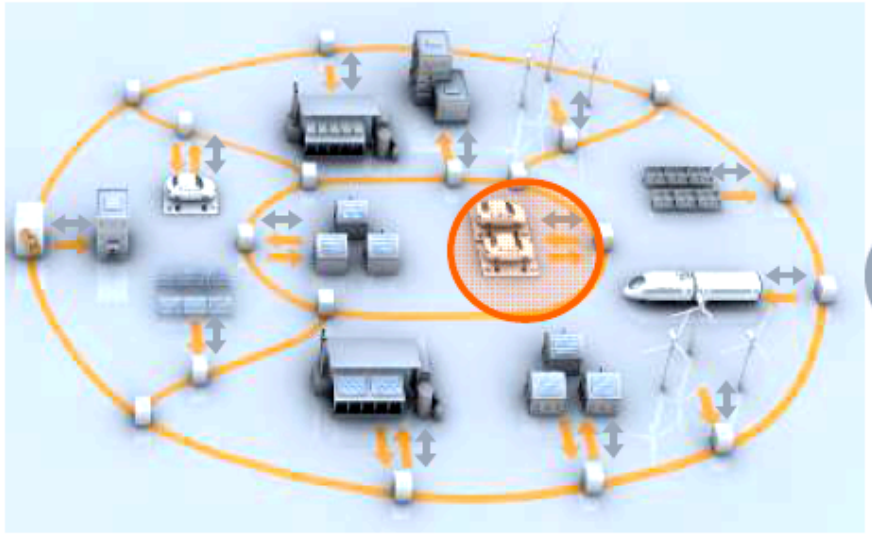
Energy: Smart Grid



Transport: Sustainable urban mobility

- Electromobility as part of the Smart Grid
  - **Sufficient energy supply** to the electric car
  - Electric cars as a **mobile storage system**

- Electromobility as **integral part of urban mobility**
  - **CO_2 reduction** through electric cars
  - **Complete urban mobility** through integration of individual and public transport

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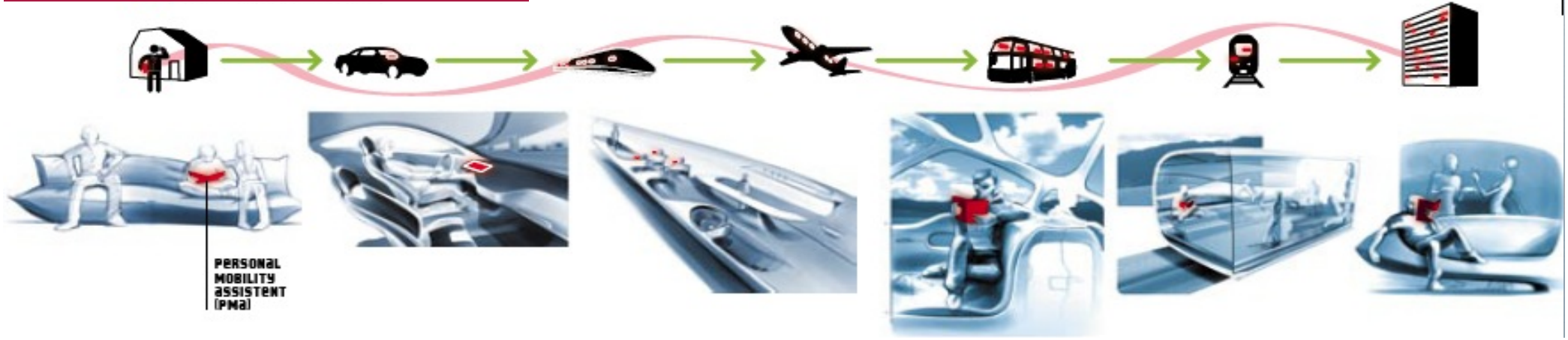
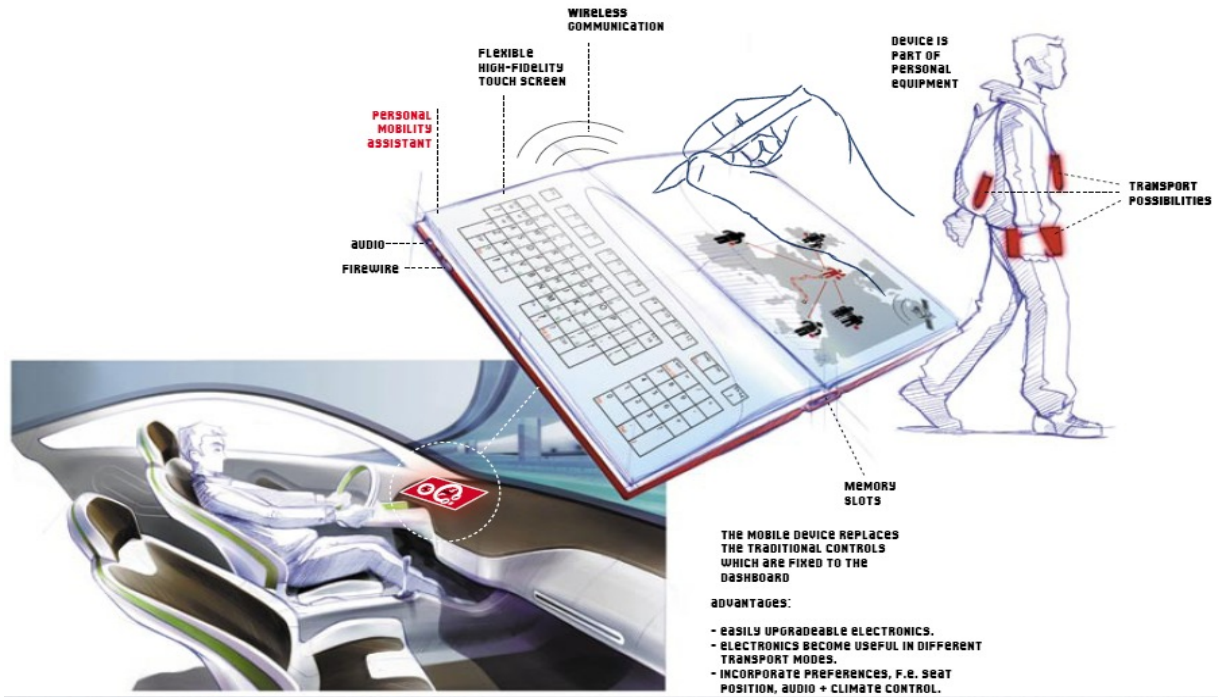
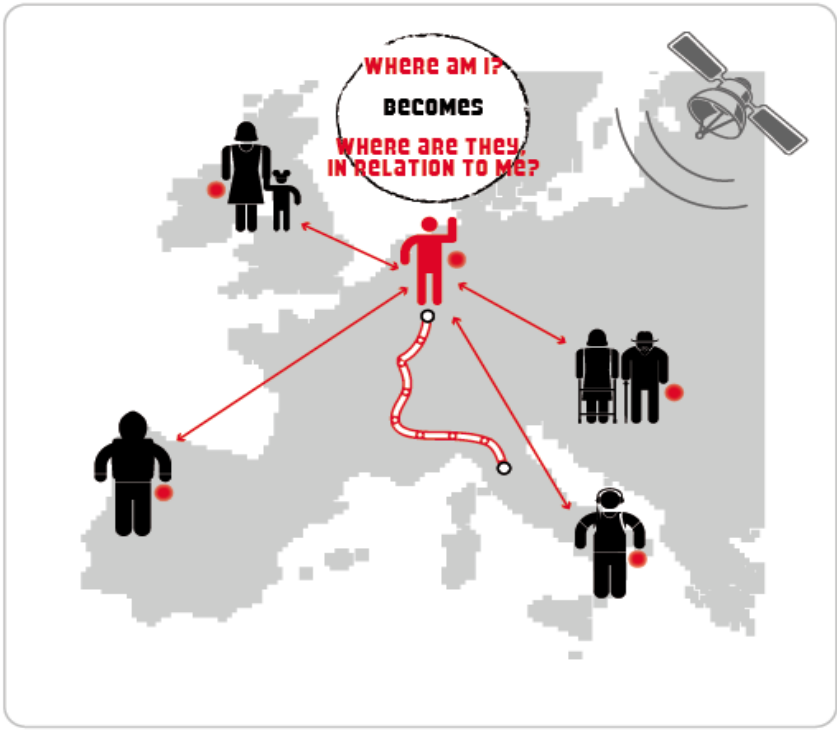
INTERMODALITY & COOPERATIVE MOBILITY







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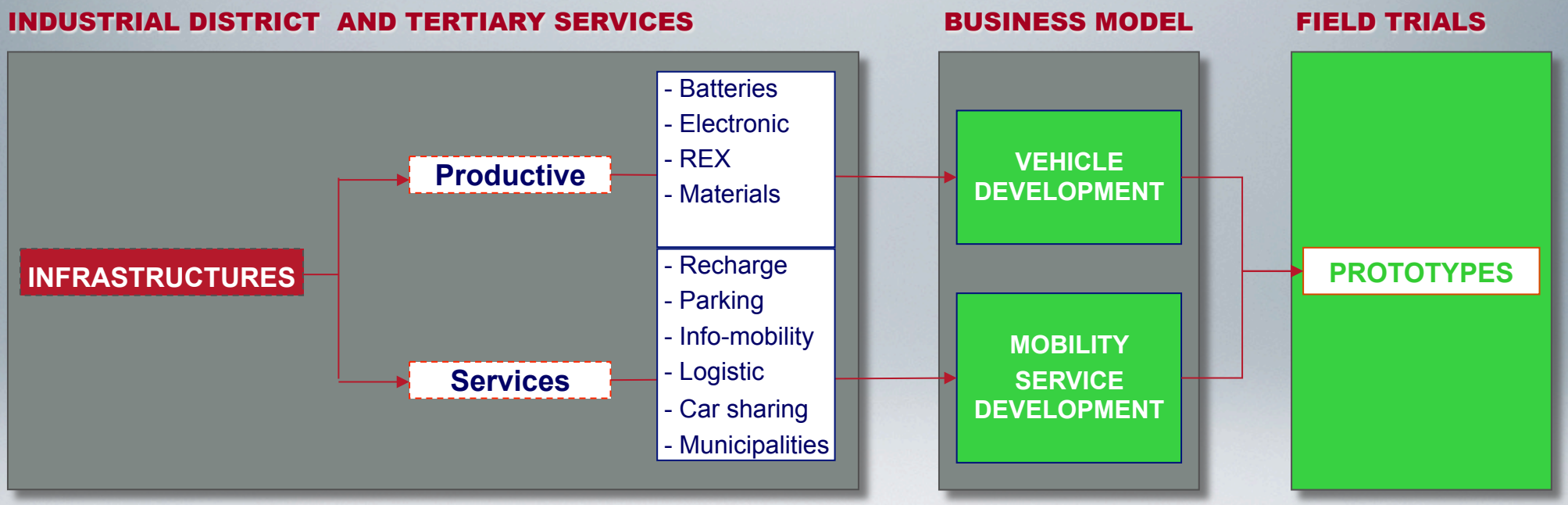

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PININFARINA NIDO PLATFORM

PININFARINA NIDO EV (2010)

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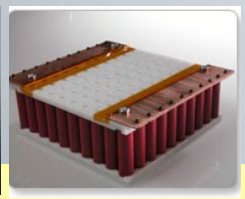
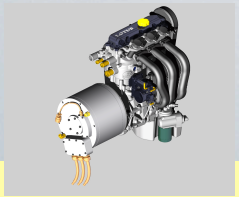
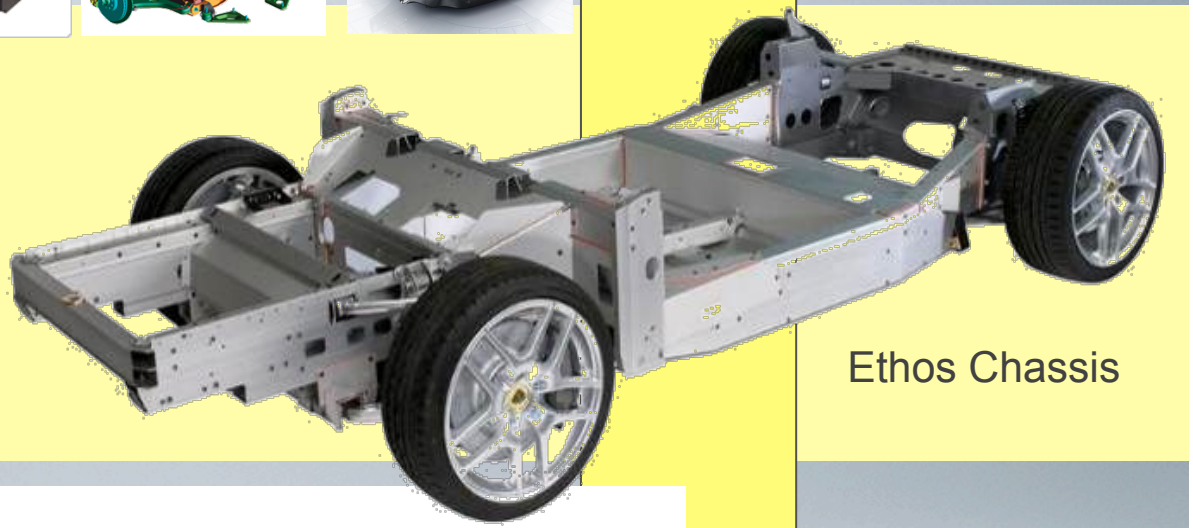
MULTIFUNCTIONAL ROLLING CHASSIS


BATTERY PACK
FUEL TANK
MECHANICHS
REX
HVAC
MOTOR
ELECTRONICS
LIGHTWEIGT MAT.



Ethos Chassis

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PRODUCT RANGE

SUSTAINABLE MOBILITY

URBAN MOBILITY

SUB URBAN MOBILITY

PERSONS

DELIVERY

URBAN + SHORT RANGE

MID RANGE

URBAN + SHORT RANGE

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ECOGEM PROJECT

ECOGEM

Cooperative
Advanced Driver
Assistance System
for Green Cars

European Green Cars Initative

SEVENTH FRAMEWORK
PROGRAMME

The **EcoGem** project goes one step further the conventional ADAS system by proposing an ADAS especially designed for Fully Electric Vehicles (FEVs).

FEVs present some special characteristics due to their electrical nature. In particular, the following factors should be taken into consideration as they effect the vehicle range autonomy:

- their energy storage capabilities are limited,
- their recharging time are long

EcoGem is designed to provide extra functionalities that ensures a comfortable and relaxed driving. The attempt is to eliminate the driver anxiety regarding:

- the distance to charging station,
- the next time of charging,
- the destination reachability,

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The EcoGem ADAS renders the FEV capable of reaching the desired destination(s) through the most energy efficient route(s) by:

- autonomous optimised route planning exploiting vehicle's own tracked records,
- cooperative optimised route planning exploiting vehicle-to-vehicle (V2V) interactions to share its route selection experiences with other EcoGem FEVs..
- cooperative optimised route planning exploiting vehicle-to-infrastructure (V2I) communication in case for instance, of Centralised fleet management.

In all planning schemes, the most energy efficient route calculation is achieved by applying machine learning algorithms on past tracked data records. These data records include:

- energy consumption information per entire route and per route segment,
- time-related information like time-zone and month,
- vehicle-specific information like battery info and consumption rate,
- map-related information like road segment inclination and length,
- weather-related information like humidity.

The EcoGem ADAS is also responsible for:

- continuous awareness of recharging points
- optimised recharging planning.

Based on the current battery levels, energy consumption rate and contextual information (desired destination, present location, daytime, traffic, user agenda, etc.), the EcoGem ADAS can prompt the driver, whenever necessary, to:

- select a recharging option (normal or fast recharging, or battery replacement)
- to book the most convenient recharging point.

Booking in advance allows for exclusive access to the recharging point at the time of arrival. The ADAS must:

- ensure that the recharging point is reached on time, by informing the driver about the optimal route to the recharging station,
- also minimise the detour caused to the driver.

Recharging management is a very critical issue considering the sensitivity and vulnerability of rechargeable electrical batteries. The lifetime and usable energy level of the battery are effected by:

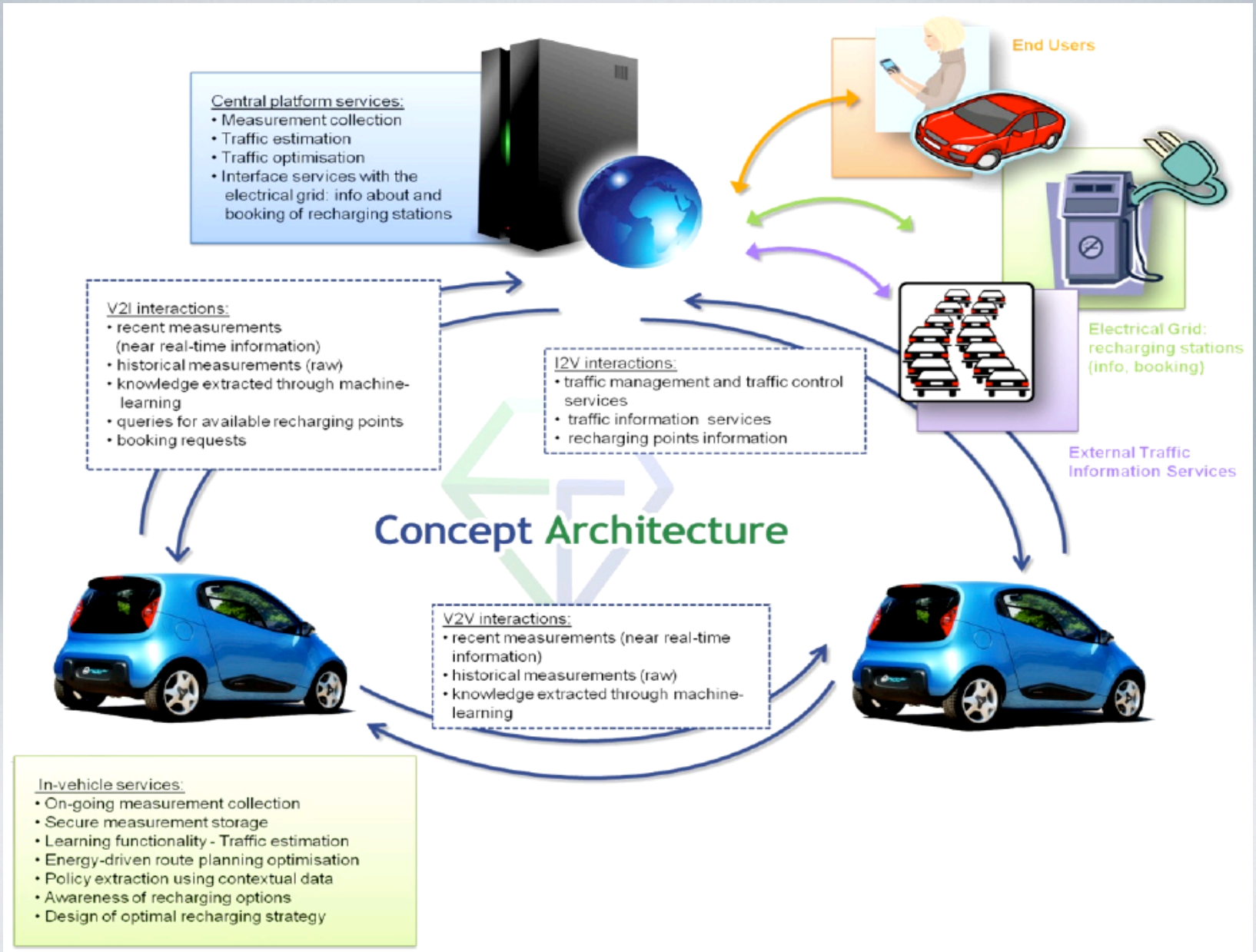
- Timing of charging, state-of-charge (SOC) level at the moment of charging,
- SOC target at the end of charging process,
- frequency of charging

Thus, **EcoGem** provides an important tool for both the vehicle and battery manufacturer to predict much more precisely the SOC levels at distances ahead.

Data regarding the availability of the nearest charging stations, as well as the traffic and road conditions data in alternative paths, can gives the input required to choose the best alternative station, taking into account:

- the minimum charging level required,
- the actual condition of the battery cells
- the amount of time available for charging.
- Different charging methods (fast charging, standard charging, or battery swapping).

ECOGEM CONCEPT ARCHITECTURE



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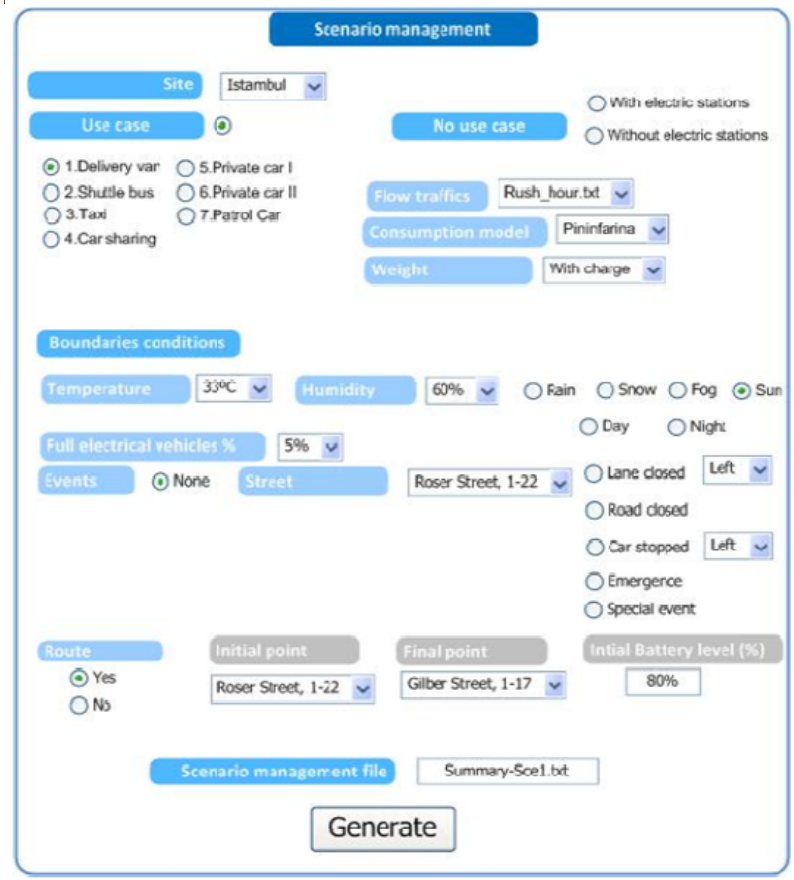

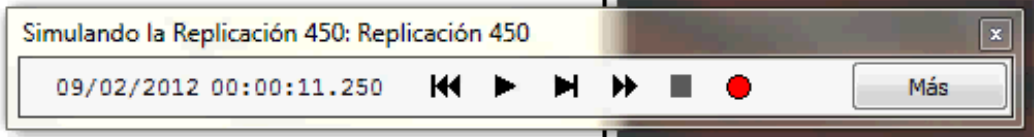

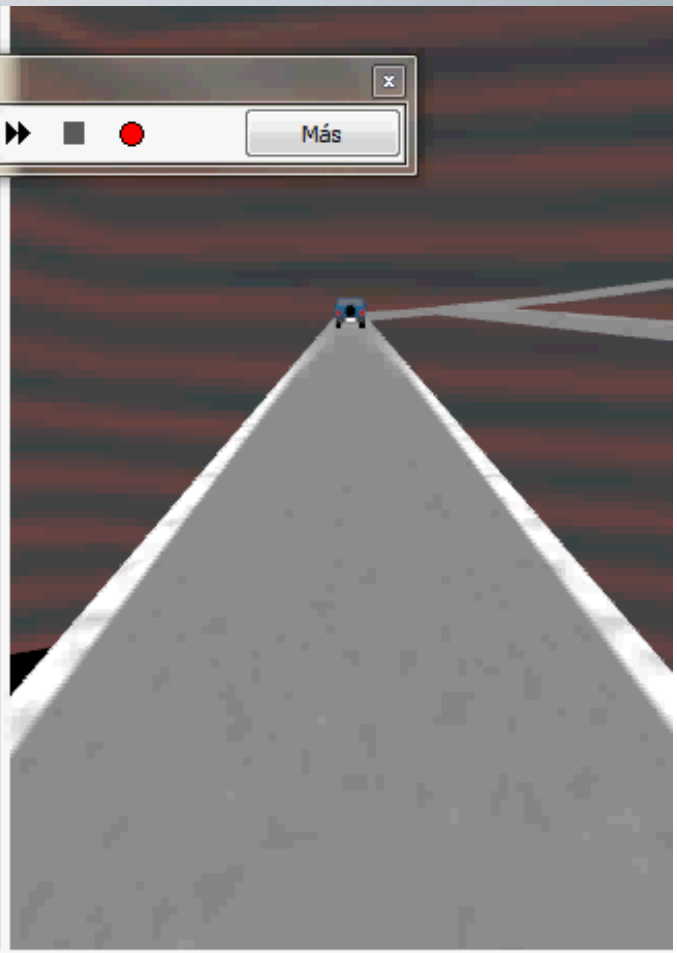

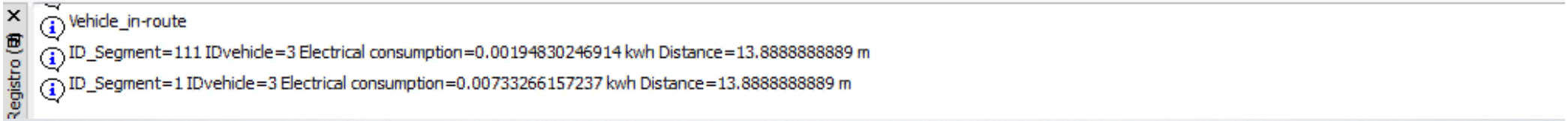

DEVELOPMENT OF SIMULATION PLATFORM

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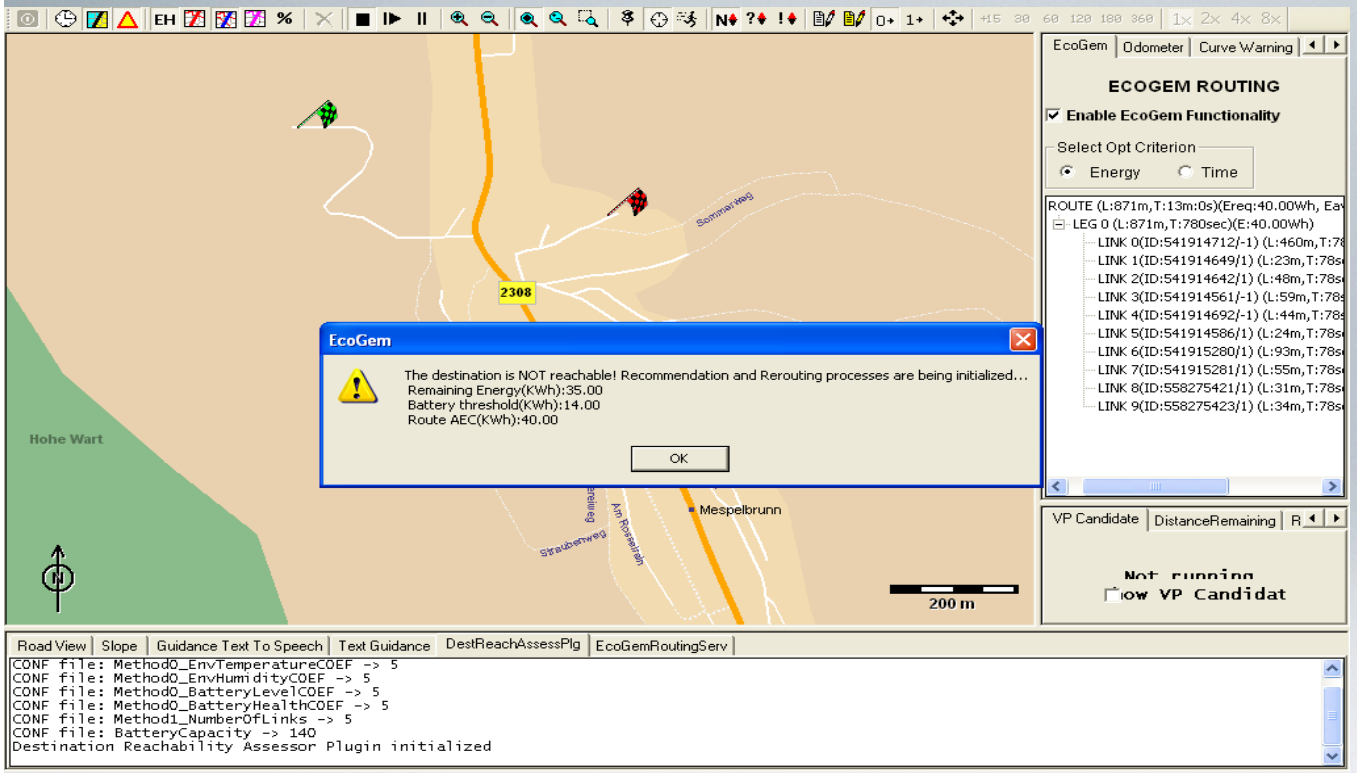
ECOGEM GUI



- Set source
- Set destination
- Route is calculated
- Battery energy is insufficient to reach destination
- A windows message box informs about the current battery energy and the required energy

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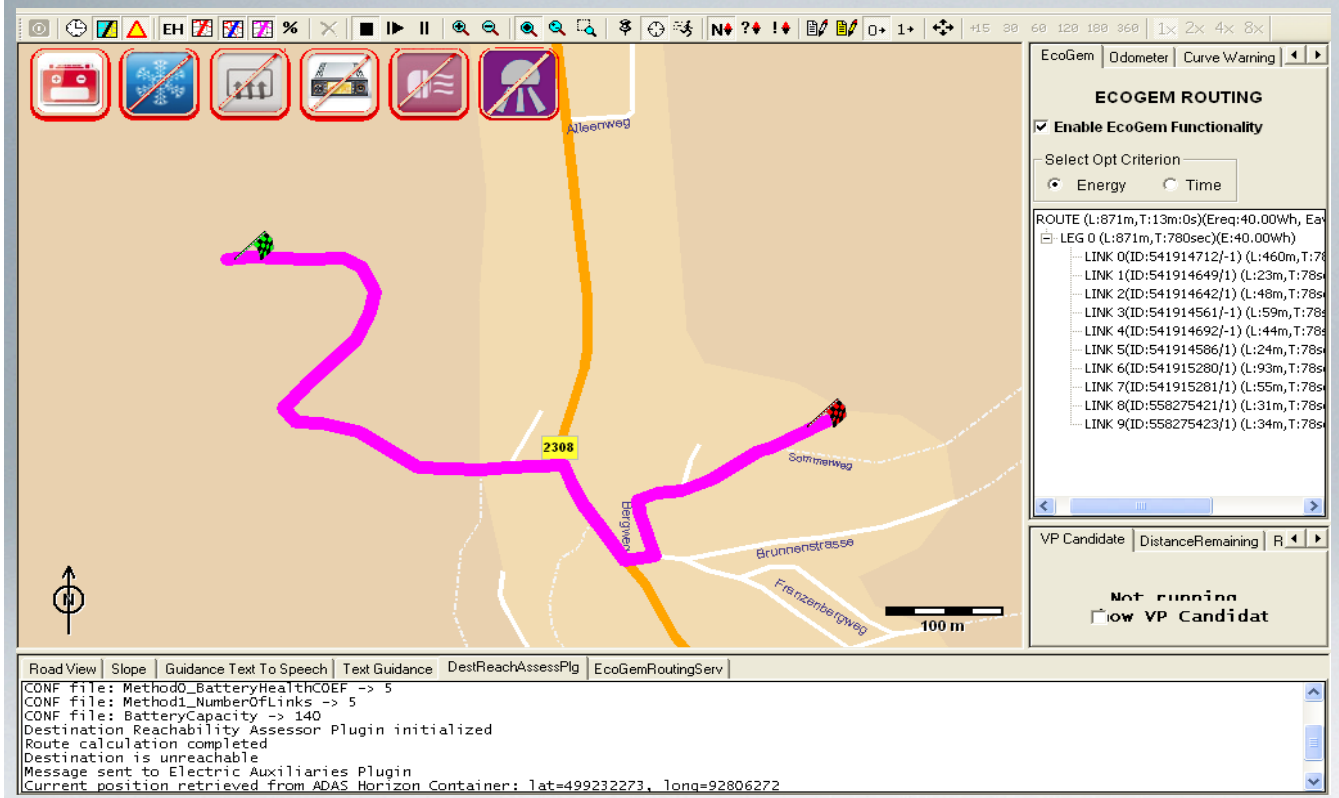
ECOGEM GUI



- Electric auxiliaries recommendations are prompted
- The Rerouting process towards the nearest recharging point is initialized
- The EcoGem plugin displays the info of the calculated route
- The log of the Destination Reachability Assessor plugin reports the performed tasks

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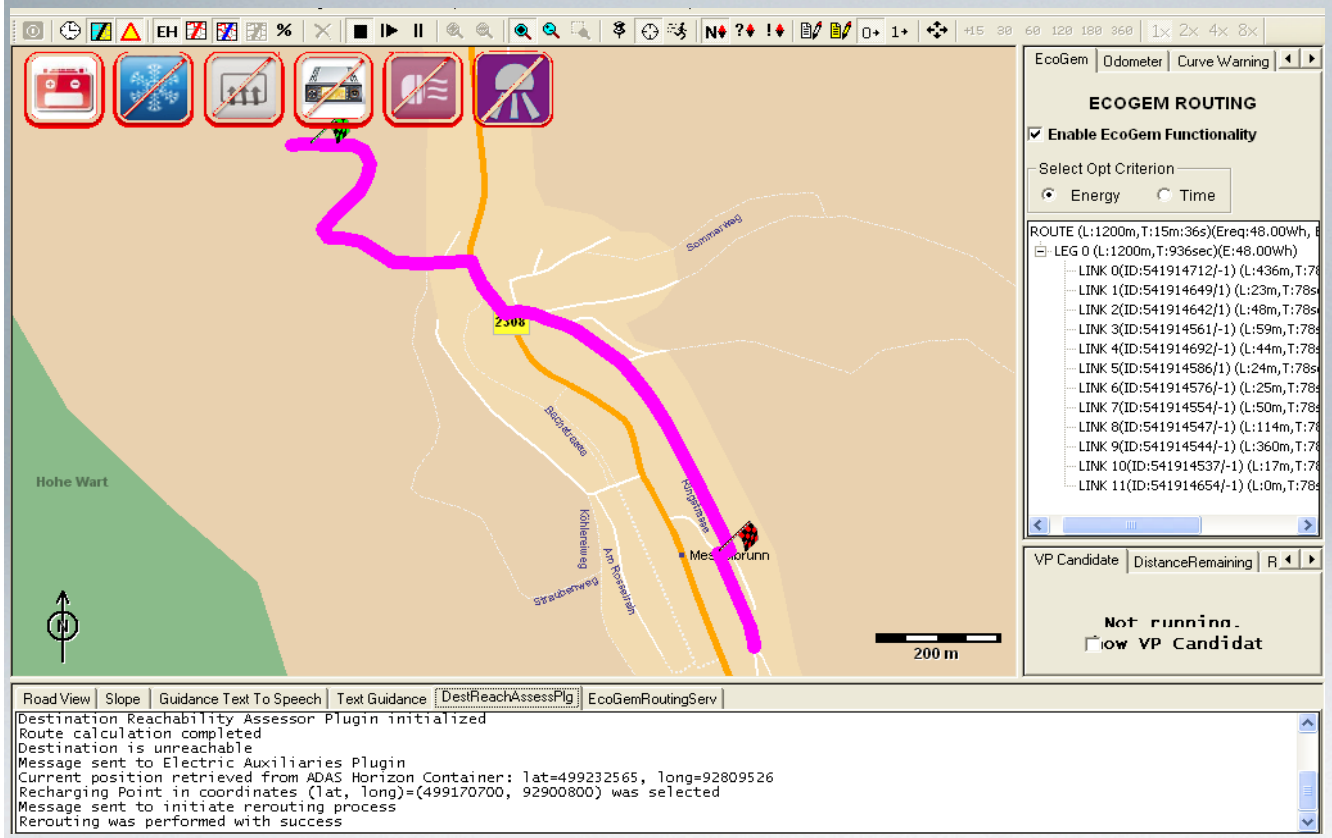
ECOGEM GUI



- The route towards the nearest recharging point is calculated

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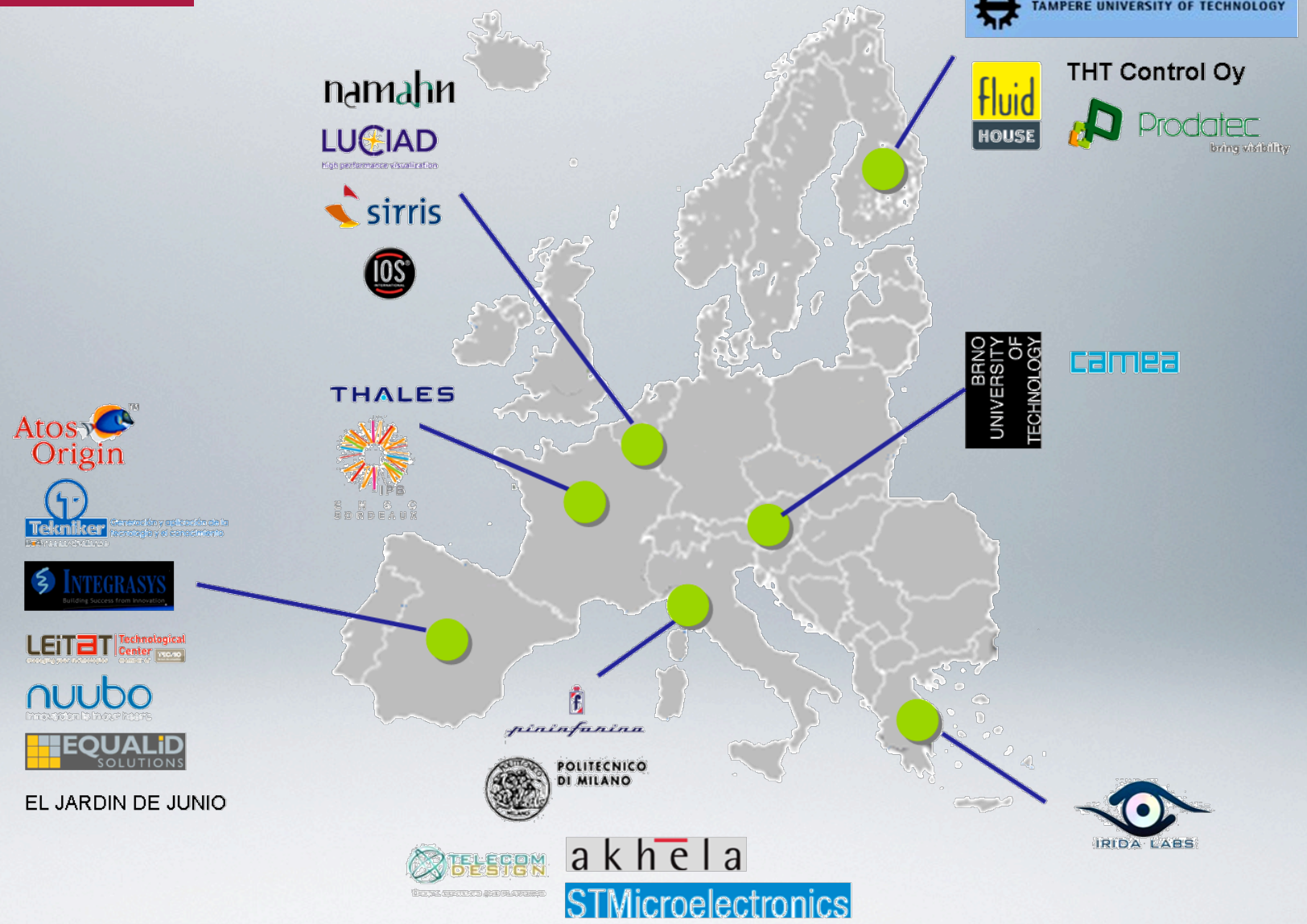
ASTUTE PROJECT



ASTUTE

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ASTUTE PROJECT MOTIVATION

- Cars expected to evolve significantly between 2015-2020
- Increasingly becoming a moving set of heterogeneous sensors interconnected to powerful application processors
- Targeting improvements on both safety and grant access to a richer set of information through innovative cloud services

ASTUTE

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DRIVER CHALLENGES (SOME) …

Users are **overwhelmed** by too many heterogeneous information and are experiencing **difficulties** when processing those to take the **right decisions**

Engine, transmission, Brakes, wheels Control

Traffic conditions

Traffic signs

Augmented Content through Services

Lighting conditions

On board Entertainment

Primary vs Secondary Sensors for car monitoring

GPS Positioning

Voice commands, Mobile communication

Car surroundings monitoring

Weather conditions

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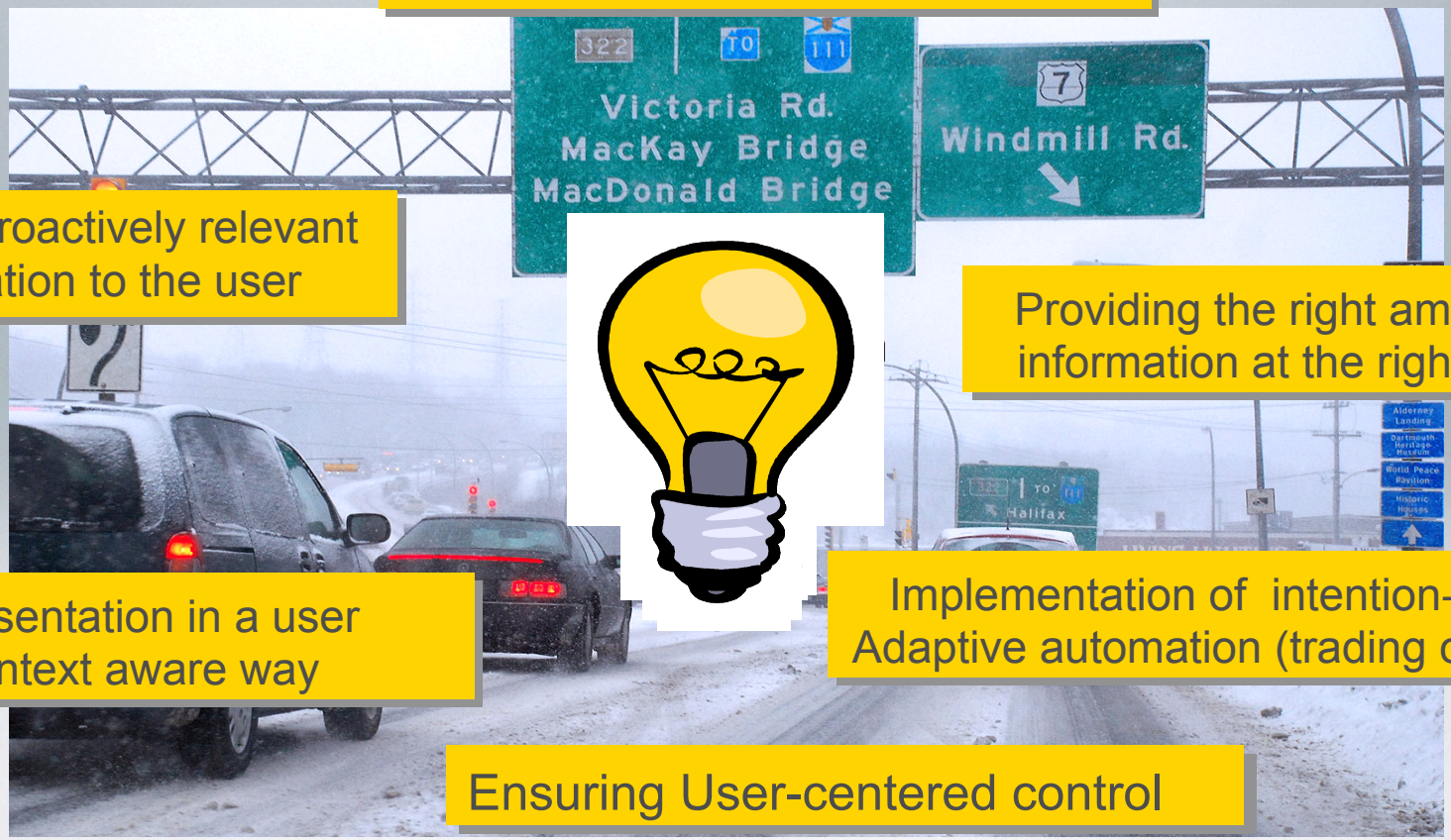
... CAN BE ADDRESSED THROUGH ...

Optimized User Choices



Pushing proactively relevant Information to the user

Providing the right amount of information at the right time

Information presentation in a user Specific and context aware way

Implementation of intention-aware Adaptive automation (trading of control)

Ensuring User-centered control

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ASTUTE GENERAL OBJECTIVE

- Enabling context-aware and pro-active decision support in complex data and information-intensive situations.
- Demonstrators for field studies :
  - avionics
  - automotive infotainment
  - emergency dispatching
  - building management
  - manufacturing process management

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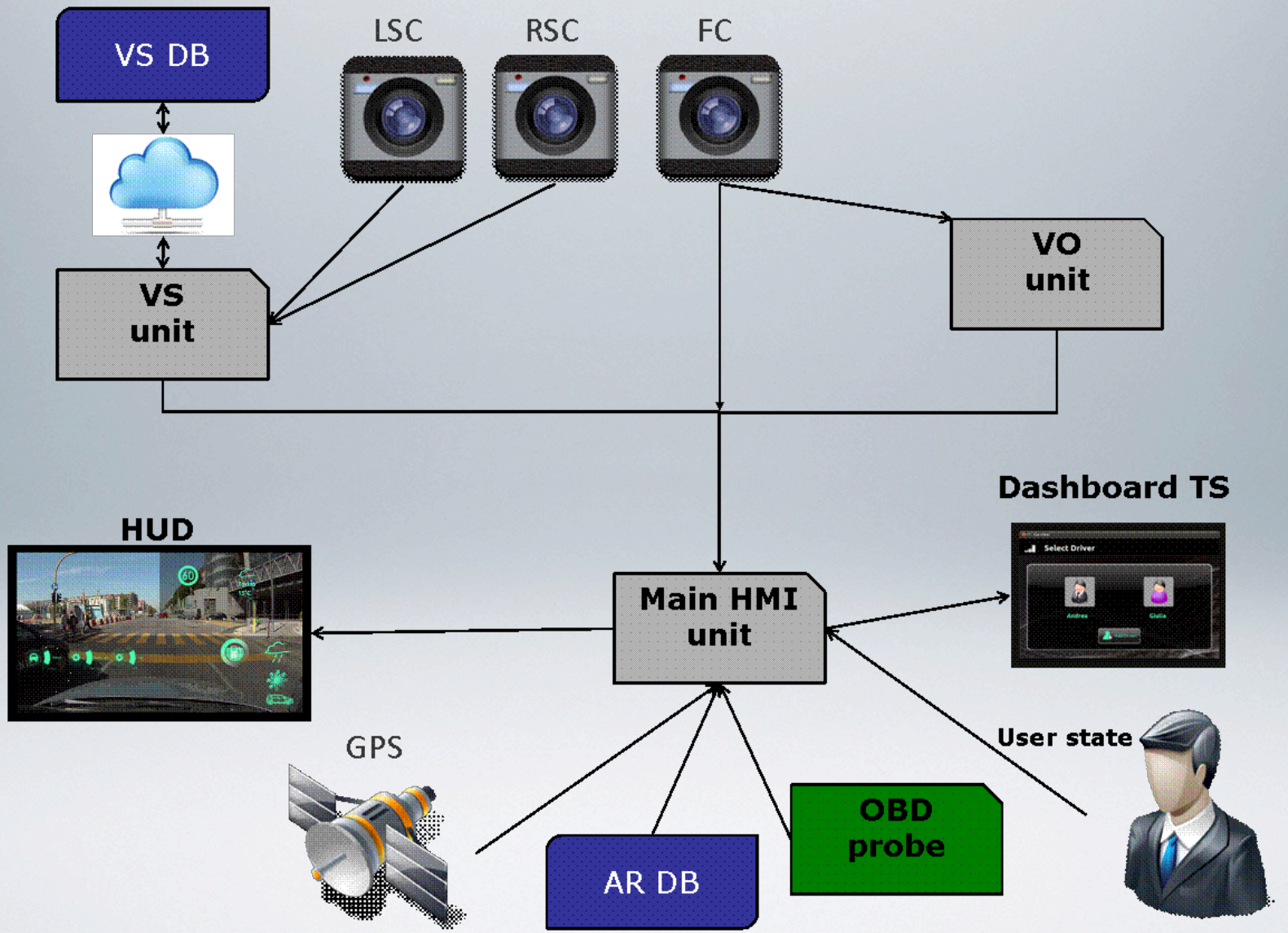
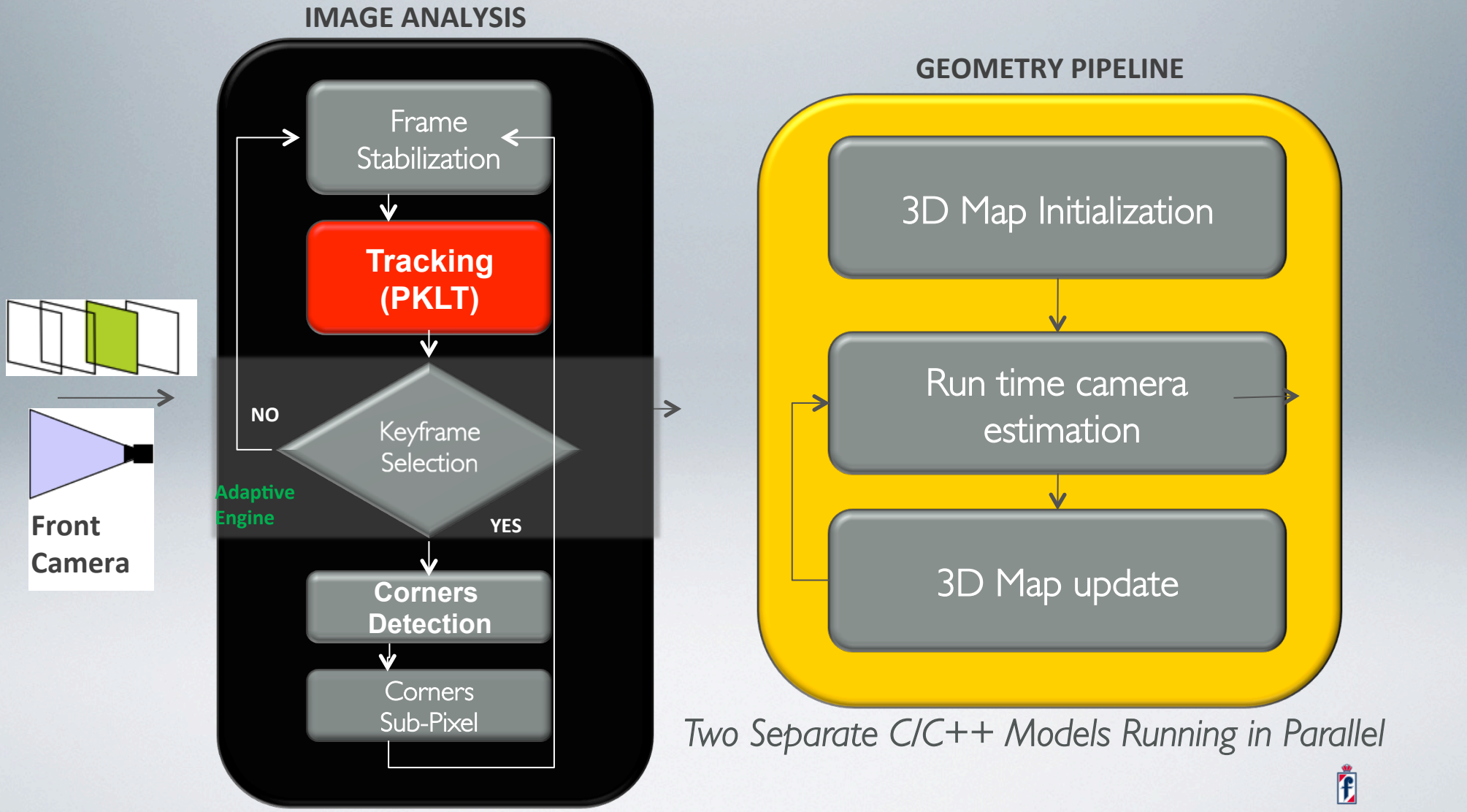
ASTUTE AUTOMOTIVE ARCHITECTURE



- **GPSD**: This daemon monitors one or more GPS receivers attached to a host computer through serial or USB ports (Bluetooth), making all data on the location/course/velocity of the sensors available to the upper layers (Aggregator).
- **OBDD** (On-Board Diagnostics): is a daemon for monitoring vehicle's self-diagnostic and reporting capability through an usb/Bluetooth adapter. OBD systems give the vehicle access to state of health information for various vehicle sub-systems.

- **User State**: This daemon reads all user parameters through external sensors connected to the system via USB/Bluetooth (ECC, EEG, Blood Oxygen Level).
- **Visual Odometry**: This daemon constantly receives the camera pose updates estimated by the visual odometry algorithm. This information is used by the GUI to correctly align the AR layer of information.
- **Visual Search**: This daemon constantly receives complex information about buildings and monuments from the Visual Search Algorithm which processes the stream coming from the side cameras.
- **SSR**: This daemon receives the information about the recognized speed road signs.

VISUAL ODOMETRY



VISUAL SEARCH SYSTEM

Query

Feature extraction (SIFT)

Feature coding (visual words)

Vector Quantization

Database search and ranking

Inverted Index

Geometric verification

Word 1

Word 2

...

Viewpoint Estimation (optional)

Results

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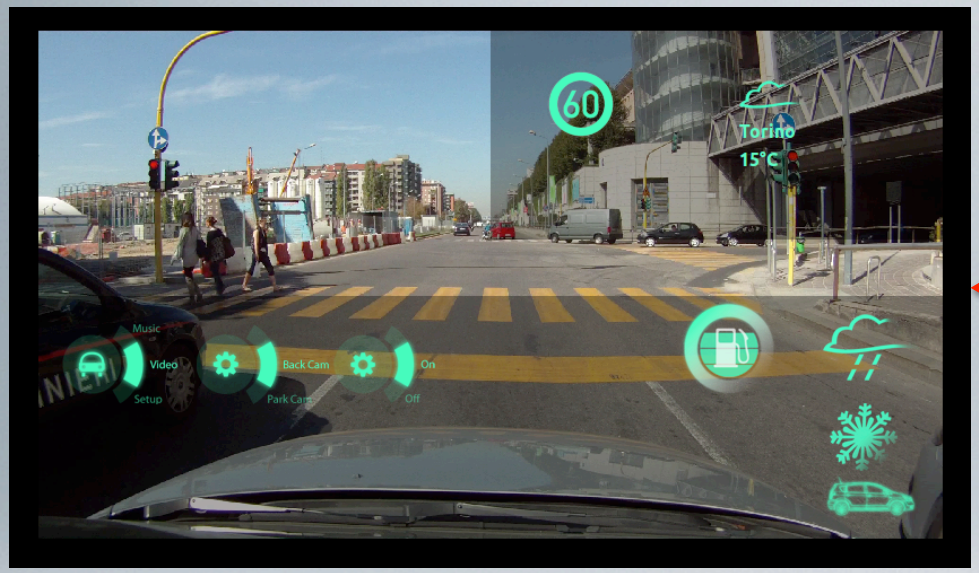
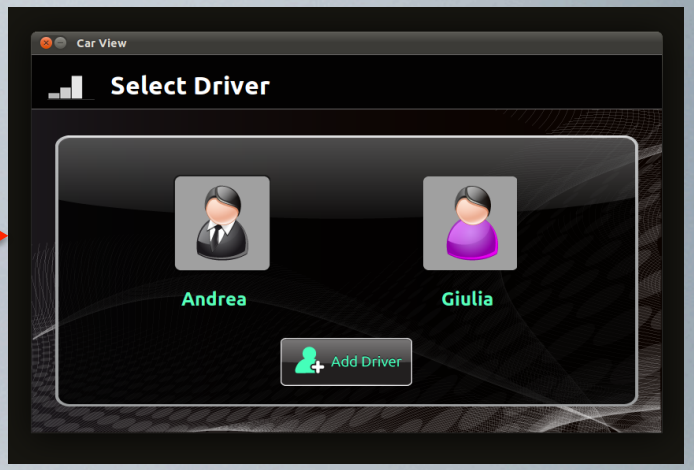
DISTRIBUTED HMI



Head-up Display



Dashboard Touch Screen

Distributed HMI Controller

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DISTRIBUTED HMI

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DISTRIBUTED HMI

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