POLITECNICO DI MILANO

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the European Mobility Week

Milan

(16-22 settembre 2013)

SMS & GREATMOB projects….

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The problem…

- Urban mobility is a **wicked problem…**
  - **Raise of the demand** for mobility of people and goods
  - **Strong externalities** (Pollution and climate change, Diseases, Congestion…) and… related costs!
- The urban mobility system is **under scrutiny**
  - **Regulators and governments** are taking more stringent positions about these problems,
  - **Citizens, media and public opinion** are more and more interested in environmentally friendly solutions for sustainable mobility

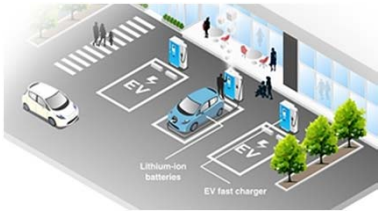
The problem…

- Need for new solutions able to deal with the complexity of mobility systems due to their nature of:
  - **Multi-stakeholders** system
  - **Multi-objective** system

- Smart Mobility For Sustainability SMS project
- Green Advanced Transport and Mobility System GreatMobs project

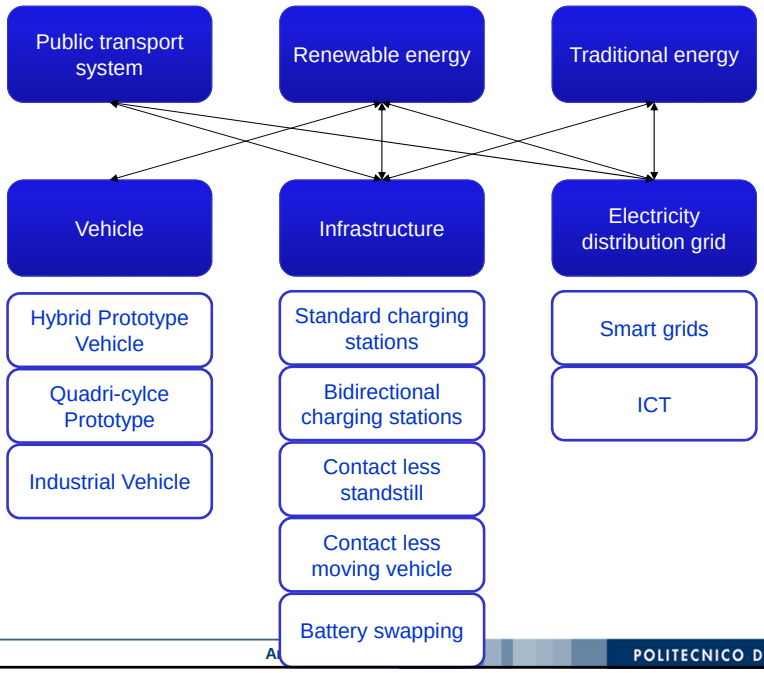
The idea of SMS project

- SMS deals with the issue of urban mobility from a **systemic perspective**
  - Shift from vehicle to infrastructure



  - Evaluation of a wide range of technological solutions linking them to the development of a dedicated **business models**

The overall system

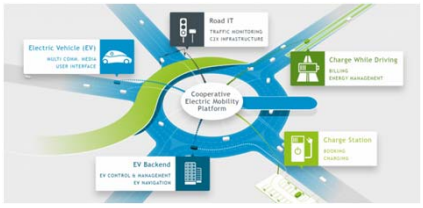


From a technological perspective…

- SMS is centered on the integration of vehicle and infrastructure to ensure **bi-directional flows** of energy and information
  - **Storage technologies**

Key issues:
- Bidirectional chargers (I2V and V2I)
- Sizing of the storage system for EV/PHEV
- Effect of the storage system on EV/PHEV vehicle and influence on vehicle dynamics (performance, comfort and handling)

  - **Communication system**



Key issues:
- Telematic platform for EV users and grid operators to provide I2V and V2I services
- Power Line Communication (PLC) for the transmission of signals in the interaction between network, vehicles and users

From a managerial perspective…

- Definition of a **new business model** in order to ensure that the technological solutions identified can be efficiently and effectively implemented and that synergies can be fully exploited.
  - **Stakeholders analysis**

Key issues:
- Stakeholders identification and prioritization
- Stakeholders involvement
- Coordination and governance mechanism

  - **Sustainability analysis**

Key issues:
- Performance measurement systems integrating environmental, social, and economic performance

- Smart Mobility For Sustainability SMS project
- Green Advanced Transport and Mobility System GreatMobs project

GreatMobs Green Advanced Transport and Mobility System

The idea of GreatMobs project

- GreatMobs will allow users to plan travel around the city, by means of multimodal connections based on different vectors and in the respect of the environmental sustainability.
- Some important aspects and features will be taken into account such as user preferences (weather conditions, propensity to walk, etc.) and trasport conditions (e.g., multi-modality, traffic conditions, pollution, best route in terms of time and cost, etc.).
- Therefore, the Project aims to raise mobility companies awareness about the use of different and sustainable vectors, contributing thereby to the reduction of environmental impacts caused by social and economic activities.

GreatMobs Green Advanced Transport and Mobility System

Innovation Topics

- Analysis and definition of mathematical models for the optimization of the multimodal routing of passengers (i.e., bus , bike, car- sharing, car-pooling , etc.);
- study of intelligent and collaborative "travel assistant" (i.e. dynamic models for routes adaptive suggestion able to exploit information and social sensing in order to increase the quality of hints);
- study of the interaction mechanisms between users and (both public and private) mobility operators, allowing different transport modes (car sharing, flexible public transport, etc.);
- experimentation of systems for electric vehicles control and management, able to optimally manage the power flows;
- development of innovative technologies for the monitoring, diagnosis, management and control of processing and generation systems, or energy use;
- integration of data analysis methods with particular reference to the technologies of neural networks and fuzzy logic;
- development of intelligent technologies for the optimal control of the electric vehicles components;
- development of evolutionary approaches (e.g. genetic algorithms, etc.) for advanced adaptive control and optimization;
- development of systems to support payment based on advanced technologies (e.g. QR codes, NFC, etc..)

GreatMobs Green Advanced Transport and Mobility System

Benefits

- People Awareness about the use of transport vehicles with low environmental impact;
- Public administrations will be able to estimate interventions aimed to improve energy efficiency as well as to plan mobility services as a result of the immediate evaluation of energy policies;
- Companies (handling green vehicles) will be able to wisely manage resources;
- Stakeholders will be able to improve travel planning.

GreatMobs Green Advanced Transport and Mobility System

Partner

Beta 80 SpA – Capofila
Siemens SpA
Infinity Technology Solution SpA
ETS SpA
Mecapron Italia Srl
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Polimi Dipartimento di Meccanica
Polimi Dipartimento di Elettronica Informazione e Bioingegneria

Green Advanced Transport and Mobility System

Research & Innovation

- Improving systems of urban mobility in order to decrease traffic and pollution
- Promoting Environmental and Energy Sustainability

LINE 1

Optimization in multimodal transport and urban mobility

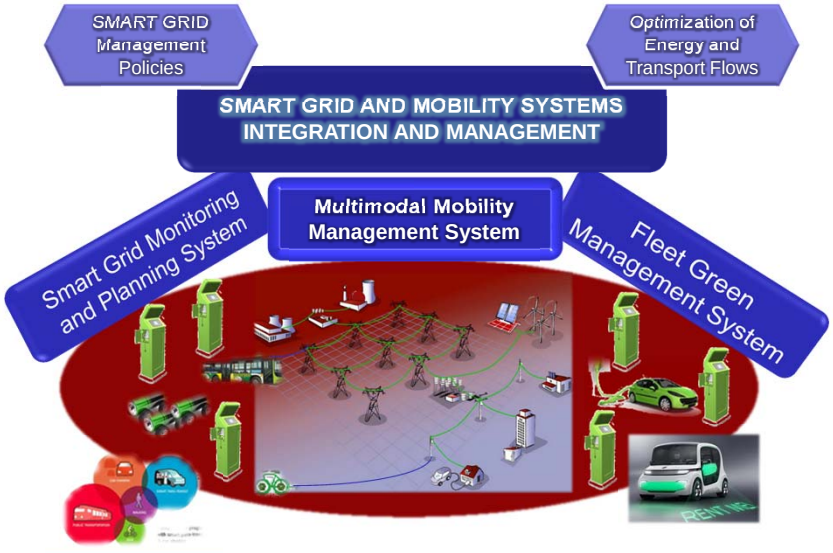
- Innovative payment and interaction systems (e.g. QR, NFC, etc..)
- Multi-objective optimization algorithms, scheduling algorithms, and so on

LINE 2

Smart Grid monitoring, control, forecasting, communication, etc.

- Neural Network, fuzzy logic, evolutionary computation
- Optimization algorithms (flow and coverage problems, etc.)
- Semantic Smart Grid Communication Architecture

Conceptual Model



In a nutshell

Multimodal Mobility Management System

Include:

- Bookings and payments management of green multimodal transport services;
- Green urban mobility management in multi-mode (car, bike, bus, car sharing, etc.);
- Hint best routes considering user preferences and profiles.

Smart Grid Monitoring and Planning System

Include:

- Smart Grid Monitoring;
- Smart Grid Optimization aimed to energy power distribution planning.

Fleet Green Management System

Include:

- Green Vehicles black box Interfacing;
- Fleet Green Monitoring.

SMART GRID AND MOBILITY SYSTEMS INTEGRATION AND MANAGEMENT

Include:

- Systems Integration Layer;
- Smart Grid Management Optimization Policies;
- Optimization of Smart Grid energy flows & Optimization of green multi-modal urban transport;
- Planning;
- Decision Support.

Green Advanced Transport and Mobility System

In a nutshell

Multimodal Mobility Management System

Research & Innovation:

- Multi-objective optimization algorithms (considering multi-modality, distances, availability, etc.);
- Payments of more segments of a route, flown in multimodality, in a single transaction using QR, NFC, etc..;
- Algorithms for the analysis of user profiles;
- Social data analysis algorithms.

Smart Grid Monitoring and Planning System

Research & Innovation:

- Flow Optimization Algorithms;
- Maximal Covering Algorithms;
- Virtual Simulation Environment.

Fleet Green Management System

Research & Innovation

- Green Vehicles Black Box and Sensor Data Analysis;
- Correlation Techniques.

SMART GRID AND MOBILITY SYSTEMS INTEGRATION AND MANAGEMENT

Research & Innovation:

The proposed PLATFORM aims to integrate innovative technological and algorithmic solutions for the management and processing of smart grid, transport, mobility and green vehicles data in order to provide value-added services in SMART CITIES (e.g. supporting the planning, monitoring, control, etc.).