

1 The MOBI.Europe Project

MOBI.Europe – Integrated and Interoperable ICT Applications for Smart Connected Electro-Mobility in Europe – is an integration project based on ICT systems that aims to guarantee interoperability of electro-mobility services across countries and the smart integration of electric vehicles into the transport and energy systems, and to ease users' adoption of electro-mobility solutions.

Electro-mobility initiatives are currently running across Europe, at national, regional and city level. Fragmentation of technological and business solutions represents the biggest risk to the creation of a truly pan-European network. Portugal and Ireland have the two first national-wide networks for electro-mobility, the city of Amsterdam has one of the most ambitious citywide programs and the region of Galicia benefits from a strong auto-industry environment. In France, Renault is one of the first OEMs to have a comprehensive strategy for the introduction of EV into the automobile market. Partners of MOBI.Europe are then key stakeholders in Europe and are engaged in contributing to the harmonization of technological and business solutions to the electro-mobility market through the interchange of information and standardization of communication protocols.

The MOBI.Europe pilots will contribute to the standardisation and openness of the electric vehicle ecosystem through a System of Systems (SoS) approach, establishing open interfaces between them and allowing for the exchange of information, setting the basis for a pan-European network of services associated with electro-mobility, whilst respecting national and local differences. Within the scope of the Project, the systems and services that will be tested are:

- International cross-country roaming;
- End-users services;
- Smart charging;
- Integration of home and public infrastructure;
- Track of CO₂ emissions from mobility;
- Creation of integrated web portal, mobile applications and on-board equipment interfaces;
- Mobility services (e.g. car-sharing, parking).

Four pilots are the cores for the demonstration of the standardisation of openness of the electric vehicle ecosystem. They are Portugal, Ireland, the region of Galicia (Spain) and the city of Amsterdam (the Netherlands).

2 Work Performed and Main Results Achieved So Far

During the second year, the MOBI.Europe project focused its activities along four main pillars:

1. Define the ICT low-level architecture to integrate the four different regions as a single ecosystem for charging Electric Vehicles, regardless of who operates the network and the country of origin;
2. Set the methodology to monitor the activity of the pilots and quantify the most relevant impact indicators, in an harmonized fashion, like CO₂ emissions avoided and number of charging operations, among others;
3. Develop the Pilot strategy and deployment plan;
4. Disseminate the project findings across the most relevant European stakeholders forums.

1. High-level ICT Framework, Pilots Specifications and ICT Interoperability Guidelines

MOBI.Europe will substantially support the build-up of a European wide charging point network by international cooperation, standardisation and harmonization. The aim is a non-discriminating "EV ecosystem" where all relevant stakeholders can link to each other.

Figure 1 describes the reference architecture at the national level. The pilots will implement a subset of the services presented by this architecture, as *individual pilots can have a variable level of services implemented*. As the architecture intends to be a System of Systems (SoS) the focus should be on the interoperability and not in the diversity of technologies and architectural choices of each pilot. Thus, it is essential to identify and specify all the services, protocols and interfaces required to develop a standard communication strategy between the systems.

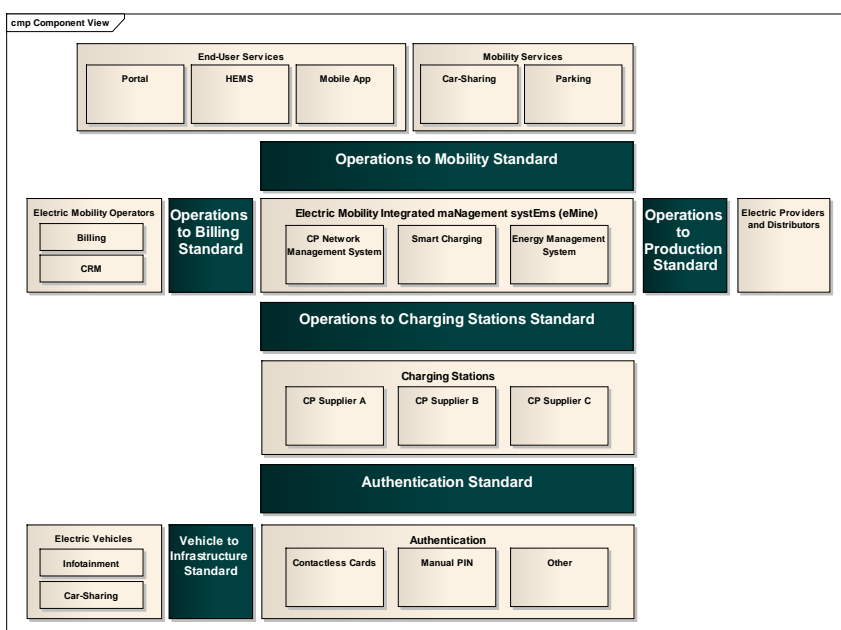


Figure 1: Reference architecture at the national level

The interoperability of several national EV Charge Systems presents a challenge in ensuring the proper integration of each Pilot Management System with the others. Mobi.Europe project proposes to address this challenge by creating a set of interoperable standards that enable a direct link between PMSs discarding the need of a central clearing house. Although the proposed solution may cope with different architecture approaches, (i.e., it's possible to implement an centralized or decentralized architecture. The consortium decided to use a decentralized architecture in this project but, when needed, the same protocol can be configured to send the messages to a centralized system, something that (for instance) is mandatory in clearing house approach.

The aim of the proposed solution is, in opposition to a centralized clearing house based solution, is to demonstrate that such approach is unnecessary and the same level of business functionalities can be offered in a peer-to-peer solution.

Trust is a crucial element to implement this peer-to-peer solution. Therefore trust mechanisms must be established between the different PMSs, which ensure origin authentication, non-repudiation of origin, confidentiality and integrity of the data exchanged. With a trust relation

established between PMS is possible to perform for a source PMS to invoke services in a destination PMS, and vice-versa, to allow roaming operation.

One side effect of the proposed solution is that charging will not be possible when the CSs are in offline mode because they cannot be reached. For now, high-end functions won't be possible in offline mode – but in the future evolutions of this architecture, other solutions may be considered to support offline mode such as, for example, the use of NFC combined with the propagation of white lists.

In the case of the roaming protocol, the specific operational guidelines for the ICT framework are represented by a set of operations that will be initiated by the source management system and must be exposed and implemented by the remote management system (the one that will provide the roaming services), as seen in the figure below.

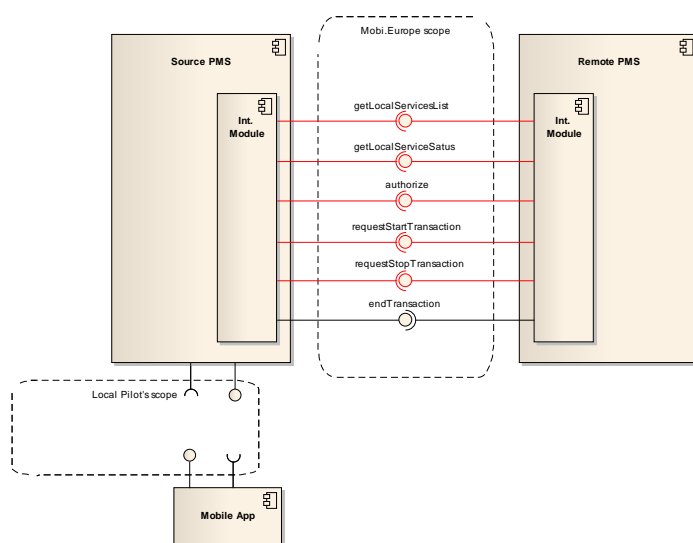


Figure 2: Operations initiated by the source Pilot Management System (PMS).

The different specifications for the pilots are thus constrained according to the roaming architecture above and very well defined in the deliverables of Work Package 2.

2. Assessment and Monitoring

The main objective for the impact assessment methodology being proposed is the data/information integration in order to have a permanent coherent snapshot of MOBI.Europe project indicators. Following indicators definition, one of the main issues for impact assessment will be the definition and proposal of data structure and templates that optimize information sharing both for attaining the DoW objectives and the scalability of the approach. With that respect, different interfaces for data communication can be envisaged and they are described in Deliverable 4.2. It is also within scope to ensure integration with other European-funded objectives namely by reusing and improving existing material and interfaces provided by the following projects: Green eMotion (External Demo Sites) and CIP Projects (ICT4EVEU, MOLECULES, smartCEM).

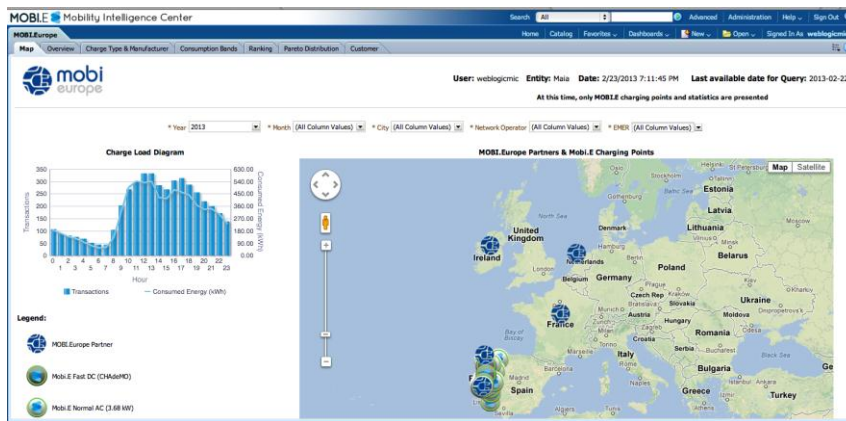


Figure 3: Screenshot of the MOBI.Europe indicators monitoring platform.

3. Pilot Strategy

With the baseline specifications available, each pilot started to construct the ICT Framework needed for the roaming services of MOBI.Europe project.

The ICT Framework is based on a peer-to-peer approach where each pilot exposes a set of external services, creating a mesh network between all pilots. These external services are implemented by each pilot within his own integration module, which is a black box makes part of its own system's and exposes standardized services to the "outside world". As such, there is no centralized system to be deployed. Instead, each pilot has to configure his integration module to allow all MOBI.Europe pilots have access to the exposed services.

Regarding the deployment and configuration of the integration modules, each pilot is responsible for configuring the external services within their own pilot, and for providing to all other pilots the data needed to access these exposed services.

The MOBI.Europe philosophy dictates that all user-driven requests initiated by a mobile application are routed through the source PMS, and are executed by the destination or "target" PMS. For clarity - the target PMS is the entity where the "Authorize", "requestStartTransaction" and "requestStopTransaction" services are exposed and implemented. Only the contents of the request / response messages between the source and target PMS's are of interest for the purposes of this system integration plan, the definition of the interface between the mobile application and source PMS is out of scope. In general, pilots need to define all valid parameters required to be given as input by the source PMS for each test case and describe the contents of the expected response for a successful execution.

4. Dissemination of Results

During the last year, MOBI.Europe was involved in a strong cooperation with the ICT Interoperability Interest Group eMI3, of which it became a member in its early stages. After eMI3 was constituted as a technological platform under ERTICO, MOBI.Europe remained as an observer at the same time that INTELI, CEiiA, Renault, ESB and Alliander assumed full membership status and seats on the managing board. eMI3 is regarded by the most relevant stakeholders on the EV business environment as the platform for setting and deploying the ICT standards for the electro-mobility ecosystem. In that sense, we have already guaranteed that the present and future results of MOBI.Europe will be properly disseminated along the relevant stakeholders. We also guaranteed that the other CIP projects (SmartCEM, MOLECULES and ICT4EVEU) would have a representation in eMI3 as observers. Cooperation with other EU funded projects like Green eMotion was also strong in 2013.

