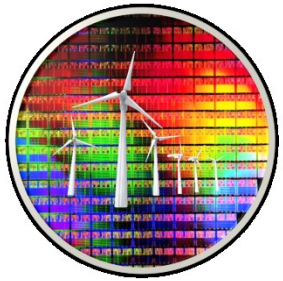
Electric Mobility



"ecoCity eMotion"

24-25th September 2014, Erlangen, Germany

An OCPP Energy Service Platform based on IoT

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Presentation Outline

- Introduction
- AICIA-GIE in IoE project
- Implementation
- Interoperability
- User interface
- Validation & Results
- Summary

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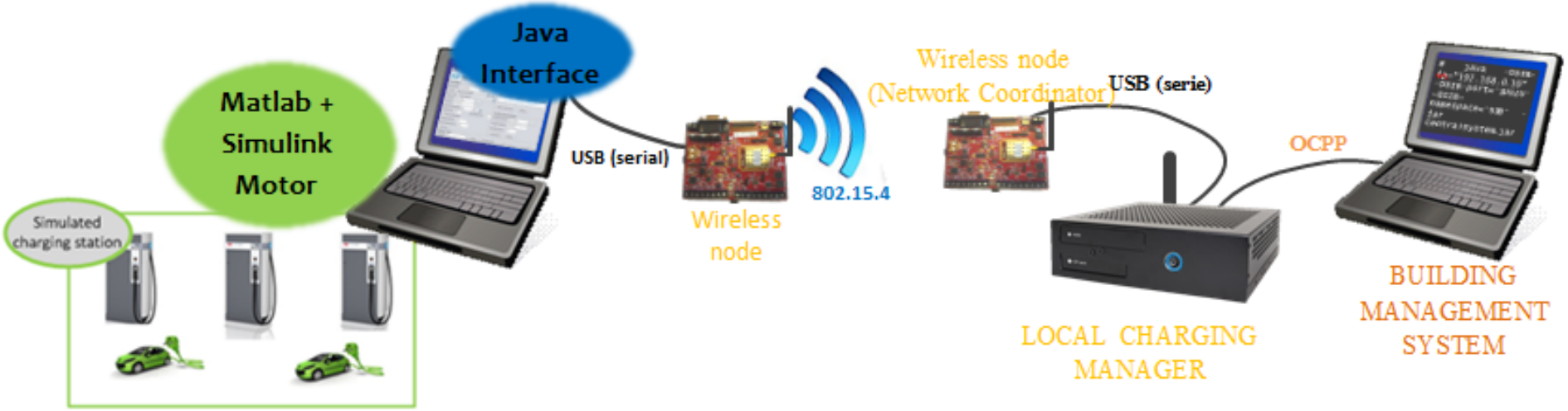
Introduction

- **Electric Mobility** is becoming a reality.
- **New ICT** systems are needed.
- **Semantic interoperability** and **Smart Environments** are pillars for the growing Semantic Web and IoT.



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AICIA-GIE in IoE project

- Our tasks

  - Developing a **standard communication network** applied to **electric vehicle system** → **OCPP (Open Charging Point Protocol)**

  - Working towards an **open source platform** able to integrate different communication technologies based on **IP** → **SmartM3**

  - Focused on **wireless radio technologies** for smart metering and for the integration of sensors and actuators → **IEEE 802.15.4**

  - Contributing to the **user interface** through a smartphone, an application for remote monitoring of charging in progress → **Android app**

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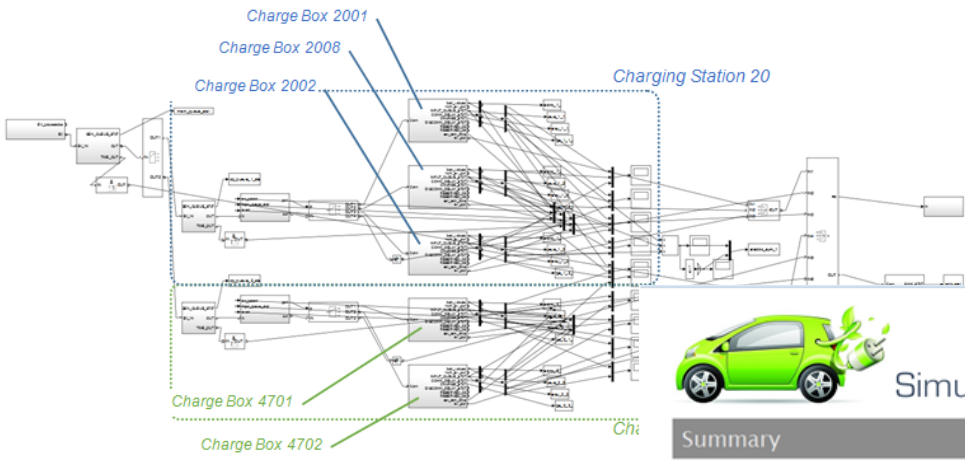
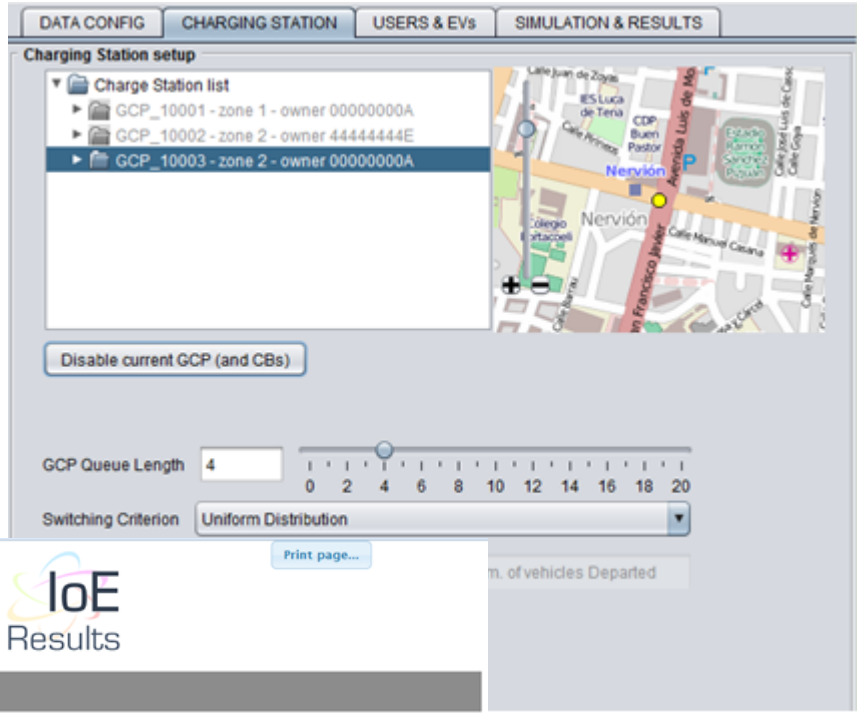
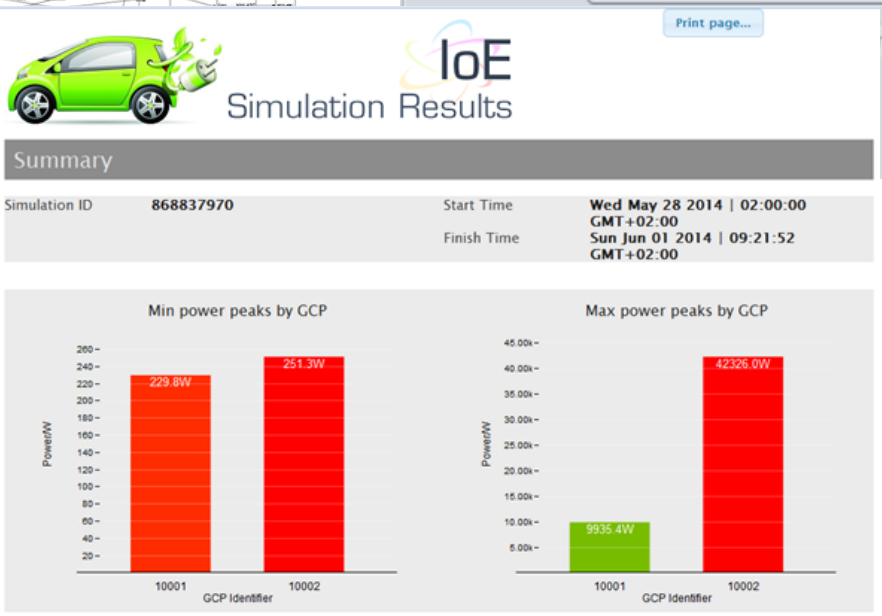
Implementation: CPs simulator

- Charging Points simulator is composed by:
  - Matlab engine.
  - Java configuration interface.
  - Pentaho reporting interface.







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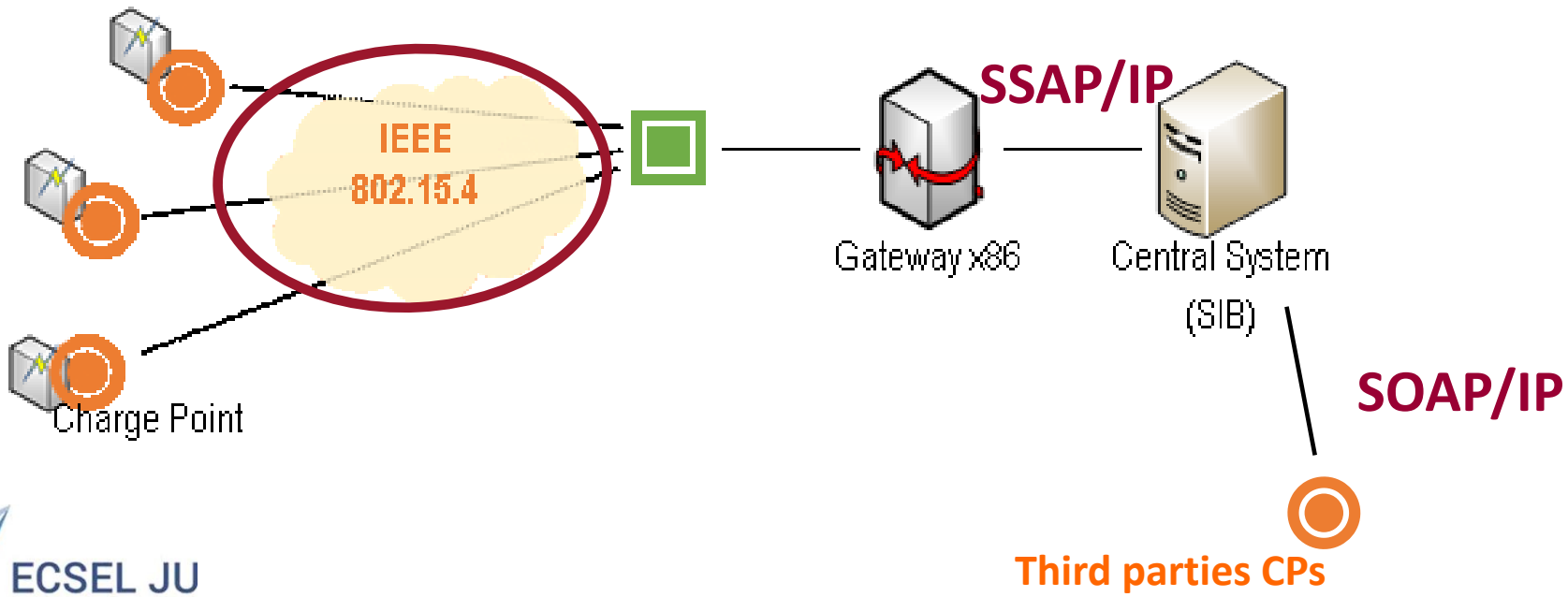
Implementation: communication technologies

- Communications technologies:
  - WSNs: **IEEE 802.15.4** for Charging Stations (EVSE – Local Charging Manager)
  - **SSAP/IP** (SmartM3 protocol, OCPP model) between our simulated Charging Stations and the Central System.
  - **SOAP/IP** (pure OCPP) between Charging Stations and Central System for third parties.



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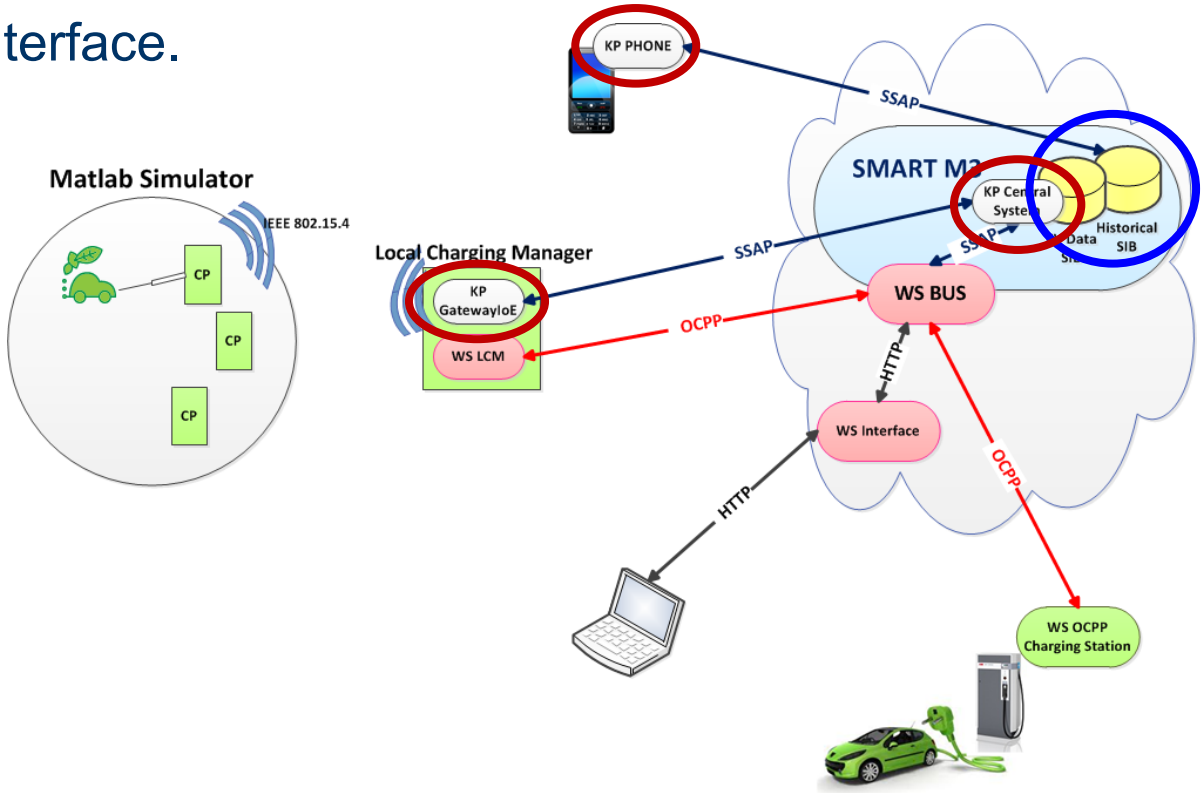
Implementation: Open source platform

- **SmartM3** is a Semantic Web open-source SW project → Smart Environments (born in ARTEMIS SOFIA project)
  - Components: **Ontology** (data structure), **SIB** (data storage) and **KP** (applications).
- AICIA Smart-M3 system:
  - **Ontology** models EV infrastructure entities. We share ontology with UNIBO.
  - **Two SIBs**: EV data SIB & Charging Historical data SIB.
  - **Three KPs**: GatewayIoE, CentralSystem and Phone

Implementation: Smart-M3 entities

- **Two SIBs**: EV data SIB & Charging Historical data SIB.
- **Three KPs**: GatewayIoE, CentralSystem and Phone.
  - Gateway IoE KP: receives the data from our simulated CP, processes and sends to the Central System.
  - CentralSystem KP: manages the interaction with the SIBs.
  - Phone KP: user interface.



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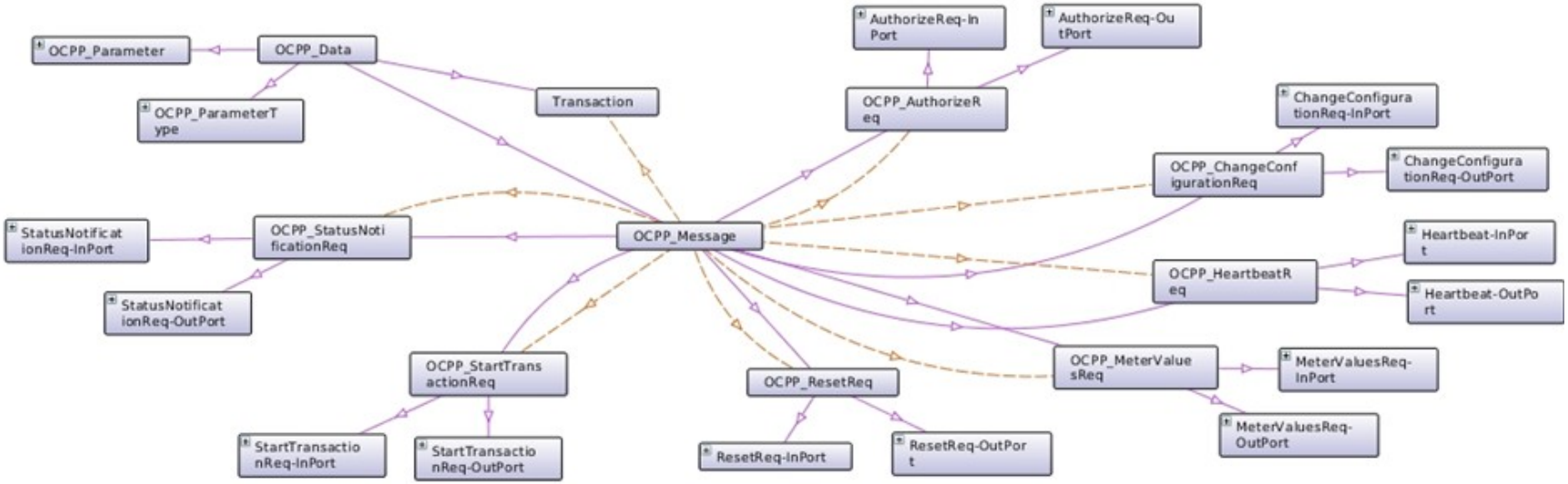
Interoperability: Smart-M3, OCPP & WS

- OCPP interoperable:
  - Applying OCPP model data to the specification of the ontology.



- OCPP interoperability using Web Services.
  - Developing an interface to enable other “pure” OCPP systems to use the SmartM3 technology in an interoperable and transparent way.

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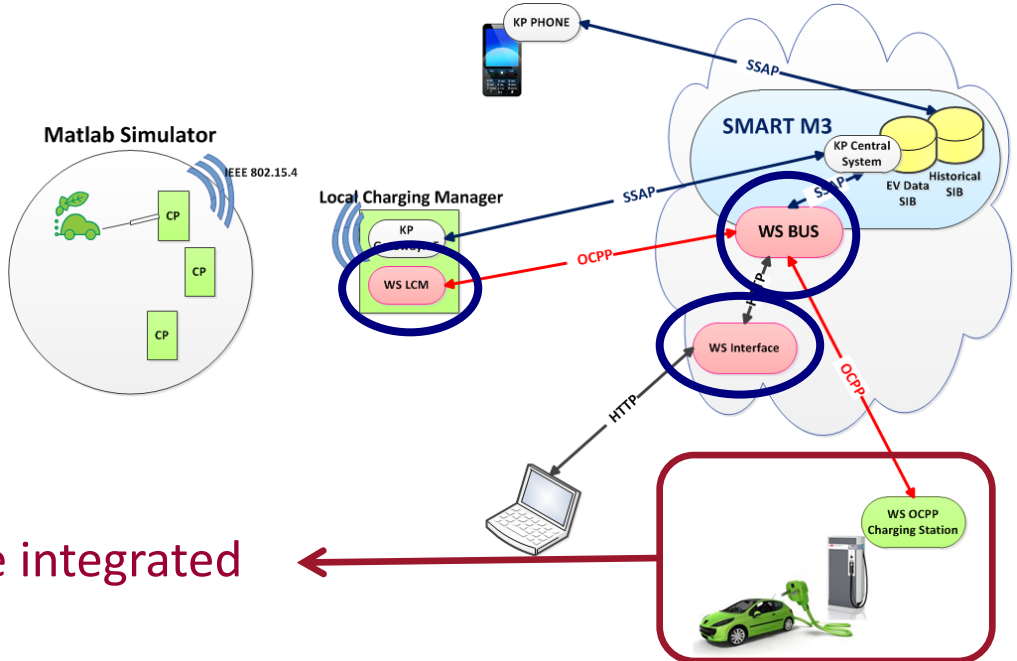
Interoperability: Web Services

- **WS Interface**: Implements a web-based interface.
- **WS LCM:** It allows the interaction with the SIB using OCPP based messages. It receives the queries from the WS BUS and responds with the corresponding results when the SIB has performed the required operation.
- **WS Bus**: Core for OCPP interoperability. Common entry point for third systems, receiving the queries coming from external web services.



Third parties can be integrated

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Web Service Interface

http://wes.gte.us.es/interfaz_ws/ocpp_network

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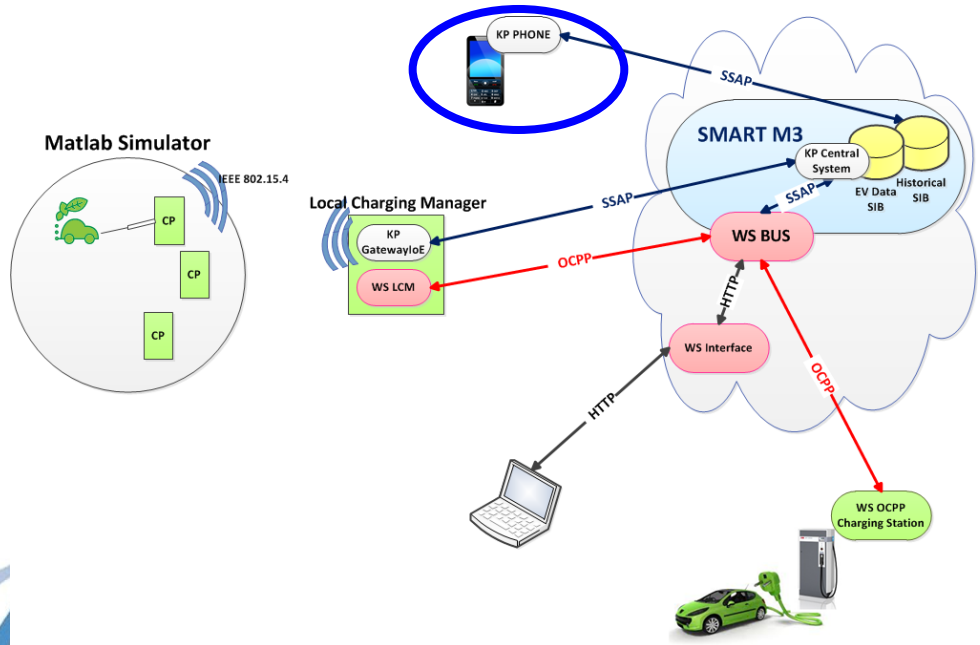
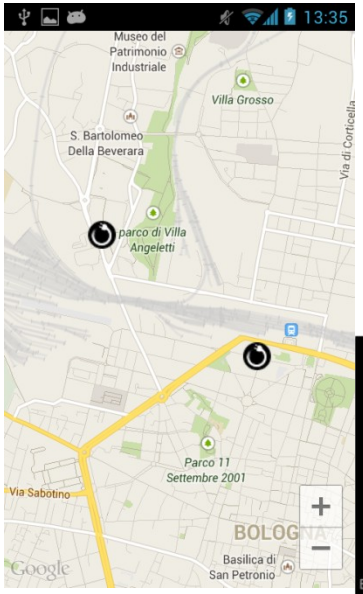
User interface: Mobile application

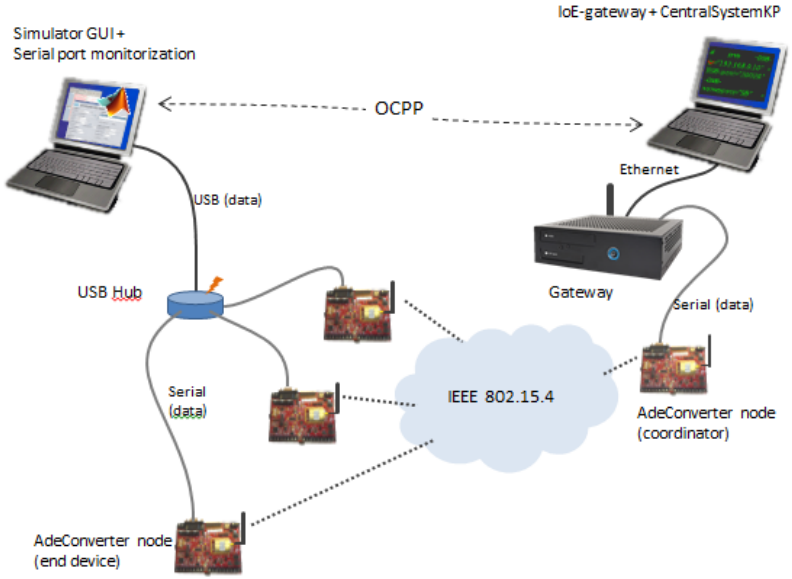
- A mobile application for Android® systems has been implemented to **monitor the EV charging process in the real time and to implement reservation service**, using subscriptions to the SIB. This application provides information about the user account, associated vehicles, previous recharges, etc.

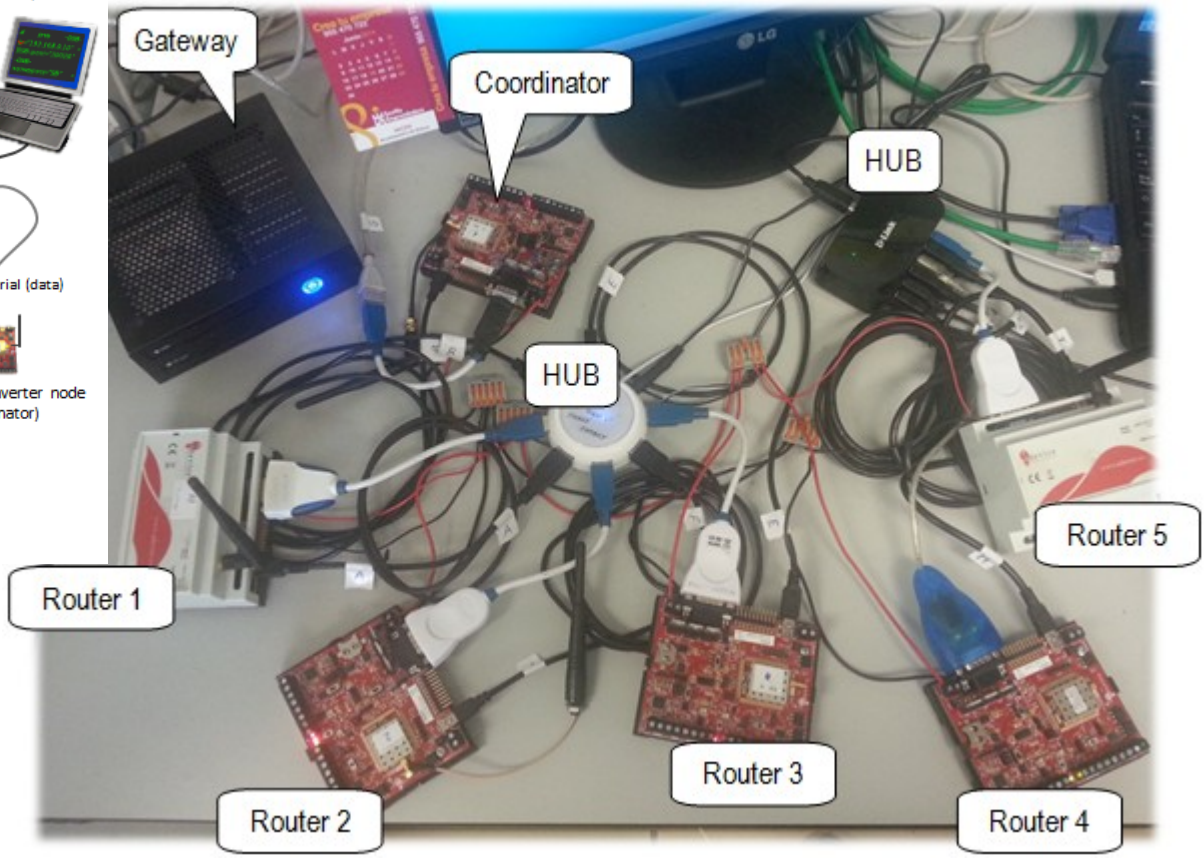




Validation & Results

- Tests:
  - Component tests → Functionality by unit.
  - System tests → Integration and interoperability.
  - Stress Tests → WLAN robustness.





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Summary

- WSNs provide wireless communication to EV Charging Stations (incoming wireless charging).
- Semantic web – SmartM3 provides
  - Interoperability with other services (Ontology specification).
  - Scalable and distributed solution.
  - Low-layers platform independence.
- OCPP provides:
  - Interoperable and standard EV communication system.
  - Independence among EVSE suppliers and Service Provider
- Complete system, from the user to the Service Provider.
  - Simulation and reporting tools → Forecastings and charging stations dimensioning for SP.
  - Android app → CPs reservations and RT charges monitoring for users.
- Open source platform.

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THANK YOU
FOR YOUR ATTENTION
Questions?

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