Welcome!

From project to market: Seamless electromobility services in Europe

NeMo Final Conference and Exhibition
Barcelona, 19th September 2019
NeMo project overview and its main achievements

Dr. Evangelia Portouli
Institute of Communication and Computer Systems
NeMo Final Conference and Exhibition
19th September 2019
NeMo at a glance

Call identifier: H2020-GV-2015

Topic: GV-8-2015 Electric vehicles’ enhanced performance and integration into the transport system and the grid

EC funding: € 7.8 million

Duration: October 2016 – September 2019

19 partners

5 test sites & 1 cross-country demonstration

Coordinator: by ICCS (Institute of Communication and Computer Systems), Greece (Dr. Angelos Amditis, a.amditis@iccs.gr)

Website: http://nemo-emobility.eu

Join us at:

LinkedIn   NeMo_Electro   @NeMo_Electro

This project has received funding from the EU’s Horizon 2020 research and innovation programme under GA no 769926
What were the challenges for NeMo?

- Lack of interoperability in electromobility services
- Diverse actors involved
- Impact to the Electric grid network
- Lack of common data exchange and commercial framework
NeMo’s approach

Develop a **Hyper-Network of tools, models and services**, which will enable the provision of **seamless and interoperable electromobility services** creating an open, distributed and widely accepted ecosystem for e-mobility

- improved accessibility to charging infrastructure and ICT services through a **pan-European Inter-Roaming framework**
- facilitate increased availability, better planning and more secure electric grid operation
- create business opportunities (increased B2B connectivity)
NeMo’s strategic objectives

- **Common Information Models**
- **Open APIs** to enable an **open B2B cloud Marketplace** for electromobility
- **Core system** for provision of electromobility services
- **Smart horizontal services**
- **Services** **self-certification** mechanism
- **Business Alliance** for ElectroMobility (BAEM)
Nemo Common Information Models

- One of the pillars of NeMo Hyper-Network is the possibility to exchange data using a **common NeMo meta-language**

  - Common Information Models (CIM)
  - Data translators and common interfaces
  - Smart Processing and Data Management algorithms
The NeMo Inter-Roaming protocol is a functional protocol that enables:

- the **direct communication** between eRoaming platforms
- publishing of eRoaming platforms’ services to the NeMo Hyper-Network, providing eRoaming features, like any other NeMo service
NeMo Hyper-Network

= Nemo Nodes operated by Business partners
All participants have access to the same data

NeMo Business Network

Shared distributed Database / Ledger:
1. Partner Management
2. Services Marketplace
3. Contract Management

B2B services
CIM

Charge Point Operator (CPO)
Charge Point Operator (CPO)
Charge Point Operator (CPO)

Electro Mobility (service) Provider (EMP)
Electro Mobility (service) Provider (EMP)
Electro Mobility (service) Provider (EMP)

NeMo Hyper-Network=
Nemo Nodes operated by Business partners
All participants have access to the same data

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## Example services in NeMo

<table>
<thead>
<tr>
<th>Category</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Horizontal Hyper-Network</strong></td>
<td>Electromobility actors’ monitoring and profiling</td>
</tr>
<tr>
<td><strong>services:</strong></td>
<td>Finder and optimiser</td>
</tr>
<tr>
<td></td>
<td>Brokerage</td>
</tr>
<tr>
<td></td>
<td>Service pricing (static and dynamic)</td>
</tr>
<tr>
<td><strong>EV driver /</strong></td>
<td>Smart navigation and journey planning</td>
</tr>
<tr>
<td><strong>owner services:</strong></td>
<td>Wireless authentication solution</td>
</tr>
<tr>
<td><strong>Grid related</strong></td>
<td>Navigation to Charging Point based on user and grid requirements</td>
</tr>
<tr>
<td><strong>services:</strong></td>
<td>Load management</td>
</tr>
<tr>
<td></td>
<td>Load forecasting due to EV charging</td>
</tr>
<tr>
<td><strong>EV and battery</strong></td>
<td>Adaptive SoC limit calculation</td>
</tr>
<tr>
<td><strong>related services:</strong></td>
<td>Capacity calculation</td>
</tr>
<tr>
<td></td>
<td>Vehicle preconditioning</td>
</tr>
</tbody>
</table>
The CRF/IBM Trustee / Neutral server: Dynamic access to vehicle data

- Secure and fair data access for 3rd parties including possibility of 3rd party anonymisation
- Data protection & data privacy through purpose-specific customer consent based on double consent mechanism

Diagram:
- Third party
- Trustee/Neutral Server
- OEM backend
- IBM

- Product/Service Offer
- Consent to transfer data to unknown Third Party via Trustee
- Acceptance of product/service offer including data transfer from OEM via Trustee to Third Party
Services self-certification processes

• Self and continuous evaluation of the service (by a service certifier) in terms of:
  – Response time
  – Accuracy
  – Availability

• Evaluation obtained by users on:
  – Efficiency
  – Availability
  – Reliability
  – Easiness to use
NeMo Test sites

Five test sites across Europe to evaluate the NeMo results

- **Spanish Test Site**
  - Horizontal services
  - Booking service

- **French Test Site**
  - E-Mobility Report
  - Vehicle preconditioning

- **German Test Site**
  - NeMo Hyper-Network tools
  - ISO 15118

- **Austrian Test Site**
  - Smart charging services
  - Grid services

- **Italian Test Site**
  - Extended vehicle and Neutral server
  - Itinerary planning monitoring SoC

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Cross-country demonstration

• Study usability, acceptance, experience of real users with the NeMo developments
  ✓ Itinerary Planning
  ✓ Cross-provider border booking authorization and payment

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Opening the Hyper-Network

The Business Alliance for Electro-Mobility (BAEM) will take over the Hyper-Network after the project end.
NeMo impact

- Enable information exchange among all involved actors

- Easy creation and delivery to a wide audience of innovative, interoperable electromobility services via the Open Cloud Marketplace

- Enhanced driver satisfaction: “Charge anywhere & anytime” across Europe via a single identification, authorisation & payment method

  ✓ Improved **attractiveness of electric vehicles**

  ✓ **Facilitation of EVs mass adoption**
Thank you! Any Questions?

Dr. Evangelia Portouli
v.portouli@iccs.gr
NeMo Hyper - Network, What It Is And How It Works

Thomas Walz

Technical Relations Executive
IBM Germany
Final Conference and Exhibition
19th September 2019
AGENDA
NeMo Hyper-Network, What it is and How it works

- NeMo IT challenges
- NeMo Main architecture principles
  - NeMo and Open Source
  - NeMo the Hyper-Network
  - Architecture of a single NeMo Node,
  - NeMo Partner Types and Roles + User roles
- NeMo Node deployment
  - NeMo Hyper-Network as of September 2019
- Standards around NeMo Services
- End to end use case overview
  - Use case and benefits using NeMo project
- Summary and conclusion
NeMo IT Challenges:

- How to develop **interoperable** and seamless electro-mobility services **without a central hosted system**
- Integration of services of **different stakeholders** still a challenge due to **missing interoperability** and **discovery mechanisms**
- No **community based** IT environment existent that enables the search, **development** and deployment of **value-added services** for the E-Mobility domain
- Lack of **common information model** for all stakeholders
- Stakeholders and business partners **not visible / transparent across Europe**
- Still difficult to **establish collaboration and contracts** between stakeholders and business partners
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NeMo main architecture principles

- “Full” Business partners operate a NeMo Node providing the core functionality to participate in the NeMo Marketplace
- “Associated” Partners can access all NeMo features via “full” Partner Node
- Service provider business partners - host implementations of the e-mobility services they offer via NeMo separate from a NeMo Node
- Interaction between NeMo nodes and services
  - Replicate marketplace data across NeMo Nodes
  - Orchestrate service-to-service calls via NeMo’s Integration Bus
- Use Open Source where possible
NeMo Node open source components

• Hyperledger Fabric
  – an enterprise-grade permissioned distributed ledger framework for developing solutions and applications;

• Hyperledger Composer
  – an extensive, open development toolset and framework for developing blockchain applications

• Loopback
  – a highly extensible, open-source Node.js framework based on Express for creating REST APIs

• Keycloak
  – an open source Identity and Access Management solution aimed at modern applications and services. It makes it easy to secure applications and services with little to no code.

• Spring Boot
  – a framework for creating stand-alone, production-grade Spring based Applications that you can "just run".

• Angular
  – a platform and framework for building client applications in HTML and TypeScript
Architecture of a single NeMo Node

NeMo Node hosted on IBM Cloud

- NeMo EM Application
- NeMo Service (atomic)
- NeMo Service (as process)
- BPMN Runtime
- Service Artifacts Server

Services registered at NeMo

- NeMo Peer Node
- NeMo Tools for Service Creation
- NeMo Service & Contract Registry Web UI

Identity & Access Management

Translator (from/to CIM)

translationSpecification

Service&Contract Registry Backend

Integration Bus

Low-Level Service Finder

Low-Level Service Optimizer

Node.js Runtime

HyperLedger

S&C Registry DB

Service&Contract Registry Blockchain

Service&Contract Registry Backend

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A scenario with multiple organizations interacting via the NeMo Hyper-Network
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NeMo Hyper-Network as of September 2019

“Full” and “Associated” Partners

Main Node
Regular Node
Affiliated Node

NeMo HYPER-NETWORK

IBM
Gireve
Verbund
fka

Technische Universität Berlin

NeMo Hyper-Network as of September 2019
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Standardized Interfaces According to Use Cases for Seamless Hyper-Network Connections

1. Service Creation, Delivery and Brokerage Environment
   - ETSI TS 101 556-3 Infrastructure to vehicle communications
   - ISO 25001 Quality criteria and the evaluation of digital software products
   - ISO 7816 RFID Card requirements
   - ISO 8583 SMS payment requirements
   - WWCP Secure internet protocol to connect market actors in e-mobility field

2. Horizontal Services
   - IEC 60870 DSO-EV transmission protocol
   - TPEG Data Protocol for the transmission of traffic and travel information
   - IEC 27001 Management System for information security

3. Distributed ledger
   - ISO 8583 Electronic transactions initiated by cardholders using payment cards
   - IEC 27001 Management System for information security
   - GOSSIP Protocol to ensure data integrity and consistency

4. Electromobility Services
   - ISO 15118 Vehicle to grid communication standard
   - DIN SPEC 70121 Electric vehicle for controlling DC Charge
   - IEC 61970 Application program interfaces for energy management system
   - IEC 62325 Standards to deregulated energy market communications
   - IEC 60870 DSO-EV transmission
   - ISO 8583 Electronic transactions initiated by payment cards
   - EMIP Communication protocol between CPO and Gireve platform
   - OCPP Communication between CP and central system
   - OICP Communication standard between EU EMP and CPO
   - Nobil-API Database of charging stations in Norway
   - Now! Innovations Protocol Industry standard for various hardware platform

Cross Use Cases Standards
- SAE J2847 Communication between plug-in vehicles and the utility grid
- SAE J2931 Digital communications for plug-in electric vehicles
- ISO 14443A RFID Card communication to proximity coupling device
- IEC 62831 User identification in EVSE
- IEC 61850 Communication networks and system in substations
- DIN 91286 EVSE ID German standard
- CHAdeMO DC charging standard for EV
- OCPP Protocol for service providers to connect to infrastructure providers
- OCPI Protocol between CPO and EMP
- OSCP Protocol for smart charging for CPO, energy management, and DSO

NeMo Hyper-Network for electromobility
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Use case 42 - Itinerary planner

An **objective** was to provide a recommendation to the European Commission on how they can regulate access to in-vehicle data using the **ExVe ISO standard and a Neutral Server.**

This was the first real use case of using such technology within the ACEA (European Automobile Manufacturer Association) working groups.

In fact, the itinerary planner is able to connect with a remote neutral server, collect data from the vehicle in real time and use them in the routing algorithm.

This is an example of a NeMo **CIM compliant response** received from the IBM neutral server:

```
{"battery_pct": 85,
"longitude": "7.5435257",
"vehicle_estimated_range": 0,
"latitude": "45.08153",
"speed_kph": 0,
"vehicle_id": "VIN11114",
"timestamp": "2019-04-05T13:32:54.683+0200",
"pos_lat_lon": "45.08153, 7.5435257",
"partialODO": 19351}
```
IBM offering 2 services to make Renault vehicle data available returning CIM compliant objects

- **NeutralServer Renault V2**: CIM Compliant (Battery, Vehicle) with API TrusteePutClearance, TrusteeGetData by IBM.
  - Renault proprietary

- **NeutralServer Honda V2**: CIM Compliant (Battery, Vehicle) with API TrusteePutClearance, TrusteeGetData by IBM.
  - Renault, Honda proprietary

**IBM Node**
- CIM Compliant (Battery, Vehicle) with API TrusteePutClearance, TrusteeGetData by IBM.
- No mapping
Representation of the IBM Neutral Server V1&V2 in NeMo for CRF, Renault, Honda & TomTom application with 3 TomTom Services registered by TomTom as affiliated partner of Gireve.
TomTom application
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Summary of NeMo accomplishments

✓ a **distributed marketplace** for trading and executing electro-mobility IT services based on Blockchain/Hyperledger technology

✓ a **common information model** to unify the business objects for all electro-mobility services and thus foster service inter-operability

✓ a **development environment** for creating e-mobility services employing **semantic search techniques** for finding suitable services

✓ a **reference network of 8 NeMo nodes** where business partners can develop, trade and execute their e-mobility services

✓ a **collection of 25+ e-mobility services** published to the NeMo Marketplace

✓ a **technical foundation** for a Business Alliance for Electro-Mobility
Thank you! Any Questions?

Thomas Walz
- Technical Relations Executive
IBM, Germany
Thomas.Walz@de.ibm.com
OPEN EUROPEAN INTER-ROAMING PROTOCOL

Thomas FOUSSE
GIREEVE
Final Conference and Exhibition
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A customer of eMobility Services Provider “A” wants access to a charging-station of Charge point Operator “B”

Is this badge authorised?
Yes/No

Giving access to EV-drivers to a very large number of charging-stations, means connecting eMSPs to a very large number of CPOs!
Connecting eMSPs and CPOs for which features? To exchange which data? which services?

- Stations info (infra descript. static & dynamic)
- Authorisation
- Charge-Detail-Record
- Business Info

Data transfer
- Charging Stations description info and CDR from CPO to eMSP
- Tokens list (“White-List”) if any from eMSP to CPO

Requests and Events
- Authorisations

Data sharing
- Business Info (agreement, tariff...)

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Roaming: Two main topologies ...

A rationale based on overall efficiency assessment. Make or buy?

**Internal management of complexity**
*IT – Contracts negotiation and follow-up – Invoicing/Payment …*

**External management of complexity**
*IT – Contracts negotiation and follow-up – Invoicing/Payment …*
Roaming: Two main topologies ... ... that can be merged ...
Roaming: Two main topologies ...
... that can be merged and integrated ...
Roaming: Two main topologies ... ... that can be merged and integrated thanks to NeMo

First NeMo’s contribution
• Setting a “Inter Roaming Platform Framework”
• Connecting 2 of them (Gireve and Hubject)

Increase the number of accessible Charging Points
Roaming: A big challenge about standardisation...
...simplified by NeMo

E-Mobility IT protocol
• OCPI, eMIP, OICP, OCHP...

E-Mobility business objects
• Contracts, Tariffs, CDRs

NeMo Hyper-Network
• Standardised access, based on
• A Common Information Model
• Open IT access & interfaces
• New services creation & deployment features
Development of inter roaming protocol

Stations info (infra descript. static & dynamic)
Authorisation
Charge-Detail-Record
Business Info

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Tests during the test drive

- eMSP A
- CPO 1
- GIREVE
- Hubject
- eMSP B
- CPO 2

Stations info (infra descript. static & dynamic)
Authorisation
Charge-Detail-Record
Business Info
Business Info
Developments and tests of Inter Roaming NeMo services

NeMo Hyper-Network

- GIREVE
- Hubject
- CPO 1
- CPO 2

Locations data

Remote start/stop

NeMo player

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Developments and tests of Inter Roaming NeMo services

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NeMo Hyper-Network

Locations data
Remote start/stop

GIREVE
Hubject

NeMo player

CPO 1
CPO 2
Business model

Nemo Inter roaming connection

Pltf 1

PEE subscription to Pltf1

EMP subscription to Pltf2

eMSP

Roaming Agreement

CPO subscription to Pltf2

Pltf 2

CPO

Contractual terms specified in NeMo Work Package 7
Open European Inter-Roaming Protocol

Thomas FOUSSE
GIREVE
Final Conference and Exhibition
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NeMo COMMON INFORMATION MODELS

Christina Anagnostopoulou
Institute of Communication and Computer Systems
NeMo Final Conference and Exhibition
19th September 2019
Rationale of the work

• Lack of Interoperability in electromobility services
• Lack of a common data and information model for objects and services
  – typically, proprietary software and data formats to communicate/exchange necessary information
  – proprietary data management and interfacing between actors
• Lack of standardisation regarding information exchange and services provision
• Electromobility actors are diverse
Common Information Models

• Models of physical objects and data structures which are relevant for the use cases selected in the project
• Based on previous relevant work, integrate existing standards on information modelling related to electromobility
• Create a consistent format for data to be available to others
Location in the Hyper-Network

- New services will generate and exchange data according to the CIM
- Data translators will enable the translation of data to the NeMo CIM

Standardised model for information sharing across the NeMo Hyper-Network

Implementation of the CIM
Methodology

• Based on electromobility information modelling (7 NeMo Business Scenarios)
• Identification of Business Objects (physical entities and data structures) that need modelling
• Definition of attributes per Business Object (name, definition, necessity, instances, format)
• Used the template of the eMi³ Electric Vehicle ICT Interface Specifications Part 2 (Charging infrastructure/charge detail record objects)
Business Objects categorisation

- Electric Vehicle
- Charging Infrastructure
- Final User
- Charge Session
- Smart Charging Functionalities
- Marketplace for service creation and delivery
- Grid loads
- Vehicle preparation for drive-off
- Support Business Objects
Business Objects categorisation

• Electric Vehicle

  • Information may come from different sources, for example the Neutral Server or a NeMo service
  • Battery
    – BatteryID, VIN, BatteryType, BatteryCapacity, SoC, SoH, BatteryFault, ChargeCompletionEstimatedTime, ChargingStatus
  • Vehicle
Business Objects categorisation

- Charge session
  - Authorisation
  - ChargeDetailRecord
    - models the information about a finished charge session (update of the eMI³ model)
  - ChargingPeriodRecord
    - One charging session consists of one or more charging periods
Business Objects categorisation

- Smart Charge
  - UserMobilityNeed
    - data structure that is sent from an EMP or from a customer’s device, in order to schedule a charging session for an EV before the next trip
  - UserChargeNeed
    - calculated energy needs for the customer’s vehicle to perform the trip planned in the customer’s request
  - ChargeProposition
    - data structure with a list of EVSEs and offered charging profiles that can cover the customer’s request
  - ChargePropositionDetail
    - one offered charging profile and cost
  - PropositionReservationRequest
  - VariableOffers
    - information relevant to the electricity grid, i.e. available power, maximum energy and price for charging per day and time in a specific area
Business Objects categorisation

- **Marketplace**

  - **ServiceContract**
    - signed between two entities
  - **ContractSection**
  - **Terms**
  - **BusinessPartner**
  - **BusinessPartnerInformation**
  - **AdditionalID**
  - **Service**
    - semantic service description exists within an OWL-S description that is referenced from the Object
  - **Category**
    - hierarchy allowing to navigate through the service catalogue
  - **ServiceContractOffering**
Business Objects categorisation

- EV User
  - User
  - UserProfile
    - Preferences, history, recurrent places and trips
  - UserChargingPreferences
  - UserDrivingPreferences
  - UserAgenda
Business Objects categorisation

- **eMobility Reporting**

  - **GetLoadReport**
    - data structure sent by an authority or energy retailer, to get the list of CDRs and the energy delivered per EVSE for a specific time period
  - **CPOLoadReport**
  - **LoadDetails**
  - **AreaLoadReport**
  - **PoDDemand**
    - energy demand per DSO fiscal smart meter with time
Business Objects categorisation

- Vehicle preparation
  - FleetMobilityNeed
  - VehiclePredictedEnergyNeed
  - PreconditioningProfile
    - notifications for the preparation of vehicle functionalities
  - VehicleFunctionNotification
Business Objects categorisation

• EV Charging infrastructure
  • ChargingConnector
  • EVSE (or Charging Point) can charge one EV at a time
  • ChargingStation, is a physical object with a User Interface
  • ChargingPool, one or more Charging Stations operated by one CPO
Support Objects

• AddressInfo
• AdminState
• Appointment
• Contact
• CostOffer
• ChargingProfile
• ChargingProfilePeriod
• CPO
• EnergyTime
• GeoCoordinate
• ItinerarySection
• LocationInfo

OpenHours
OperationalState
ParkingInfo
PowerTime
RecurrentUserPlace
RecurrentUserTrip
TimeFrequency
TimePeriod
Trip
UserComments
## Examples

### UserMobilityNeed

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>DEFINITION</th>
<th>INST.</th>
<th>M/O</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>eMAID</td>
<td>eMobility Account Identifier, as in ISO/IEC 15118.</td>
<td>1</td>
<td>M</td>
<td>string</td>
</tr>
<tr>
<td>RequestID</td>
<td>This is a unique identifier of the request</td>
<td>1</td>
<td>M</td>
<td>string</td>
</tr>
<tr>
<td>ItinerarySections</td>
<td>The list of itinerary sections that comprise the next trip</td>
<td>n</td>
<td>M</td>
<td>List of complex “ItinerarySection”</td>
</tr>
<tr>
<td>Vehicle</td>
<td>This is a reference to the description of the vehicle.</td>
<td>1</td>
<td>O</td>
<td>complex “Vehicle”</td>
</tr>
<tr>
<td>ItineraryEnergyNeed</td>
<td>This is a list of the energy need (in kWh) of the vehicle at the start of each itinerary section in order to complete the next itinerary section</td>
<td>n</td>
<td>M</td>
<td>List of double</td>
</tr>
<tr>
<td>TripEnergyNeed</td>
<td>This is the total energy need (in kWh) of the vehicle in order to complete the next trip</td>
<td>1</td>
<td>M</td>
<td>double</td>
</tr>
</tbody>
</table>
CIM via NeMo components

Phase I: Service creation

Generation of the translation transformation logic to be used during service invocation based on: bidirectional PSM-to-CIM mapping, services semantic annotation (service creation tools), service registration

Phase II: Service invocation

Execution of the transformation workflow generated during Phase I on service request/response messages, dynamic services search and execution

Service inputs from CIM => proprietary language
Service outputs from proprietary language => CIM

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Conclusions

- Common Information Models for electromobility business objects
  - Enable information exchange among all involved actors
  - Data translators will enable the translation of data to the NeMo CIM
  - New services will generate and exchange data according to the CIM
  - Integration of smart services
- Liaison with standardization groups - eMi³
- CIM second version is released
Thank you! Any Questions?

Christina Anagnostopoulou
ICCS
christina.anagnostopoulou@iccs.gr
EASY SERVICE CREATION

Nils Masuch
Technical University Berlin
Final Conference and Exhibition
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What is Service Creation in NeMo?

• Supporting the integration of existing services into the NeMo Network
What is Service Creation in NeMo?

- Supporting the integration of existing services into the NeMo Network
What is Service Creation in NeMo?

• Supporting the integration of existing services into the NeMo Network
What is Service Creation in NeMo?

• Supporting the creation of composite services that rely on several services provided via NeMo Network
What is Service Creation in NeMo?

- Supporting the creation of composite services that rely on several services provided via NeMo Network
What is Service Creation in NeMo?

• Supporting the creation of composite services that rely on several services provided via NeMo Network
What is Service Creation in NeMo?

- Supporting the creation of composite services that rely on several services provided via NeMo Network
What is Service Creation in NeMo?

- Supporting the creation of composite services that rely on several services provided via NeMo Network
How does NeMo support creating Composite Services?

- Provision of a toolchain from first idea to finalized service
How does NeMo support creating Composite Services?

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- Provision of a toolchain from first idea to finalized service
How does NeMo support creating Composite Services?

- Provision of a toolchain from first idea to finalized service
How does NeMo support creating Composite Services?

- Provision of a toolchain from first idea to finalized service
How can I use these tools?

• Tools integrated in Eclipse

• Available as a Docker image for easy deployment

• Tools available on Docker Hub

• More Details @ Technical Session (11:50 am)
Thank you!
Any Questions?

Nils Masuch
Technical University Berlin
SMART SERVICES FOR ELECTROMOBILITY

Stefano Persi
Mosaic Factor
Final Conference and Exhibition
19th September 2019
Agenda

- B2B Marketplace for electromobility services
- Benefits of the marketplace
- NeMo Services use cases
- Service Brokerage
B2B Marketplace for electromobility services

Services provide added-on functionality usable in the whole environment
Benefits of the marketplace

Provide seamless interoperability of B2B and B2C electromobility services

**SERVICE PROVIDERS**
- Provide a set of new and existing services
- Easy to publish
- Combine different services to give added value to the users
- Get a better knowledge of users

**EMOBILITY USERS**
- Access to global services
- Single platform/interface
- Easy to access
- Combine different services
- eRoaming interoperability
NeMo Services use cases

**DAILY COMMUTE**

**Service Brokerage**
- Fit the actors’ requests to existing services

**Smart navigation**
- Availability and location of CPs
- Road traffic and
- Battery SOC

**CPO monitoring and profiling**
- CP availability
- Irregular activity
- Generate valuable personal and non-personal information

**EV driver monitor and profiling**
- Mobility patterns
- User interests
- Generate valuable personal and non-personal information

**Smart Journey Planner**
- Route planning

**OCCASIONAL TRIPS**

**Rating/pricing services**

**CP Booking**

**Smart navigation**
- Route calculation
- CP availability
- Required EV charge time
- Battery SOC

**Wireless authentication service**
- Access control
- Identification, authentication and authorization

**CPO monitoring and profiling**
- CP availability
- Irregular activity
- Generate valuable personal and non-personal information
CP Prediction

CP usage historical & real-time information

SHORT & LONG-TERM PREDICTION
Service Brokerage (I)

User mobility life simulator
- User insights and mobility patterns
- Clustering of users’ profile

EV driver monitoring & profiling
- Mobility tracker
- Recurrent places

CP monitoring & profiling
- CP usage patterns
- Short and long term prediction

SERVICE BROKERAGE
- Best location and schedule
- Optimise CP services
Service Brokerage (III)

Occupancy level
- Low (< 0.4)
- Medium (0.4-0.8)
- High (> 0.8)

With Broker
- Occupancy levels are distributed across the map.
- The map shows the distribution of occupancy levels with brokers.

Without Broker
- Occupancy levels are distributed across the map.
- The map shows the distribution of occupancy levels without brokers.
Thank you! Any Questions?

Stefano Persi
CEO of Mosaic Factor
stefano.persi@mosaicfactor.com
www.mosaicfactor.com
EVALUATION ACTIVITIES AND NeMO IMPACT

Christophe Moure
Applus IDIADA
Final Conference and Exhibition
19th September 2019
Agenda

• Validation of the NeMo HyperNetwork

• Evaluation activities in test sites

• European Electromobility Test Drive
Validation of the NeMo HyperNetwork
NeMo Hackaton

• Purpose
  – Evaluation of the effectiveness of the Hyper-Network open tools for services creation
  – Validation of the NeMo APIs
  – Verification the added value of horizontal services
  – Validation of the easiness of data integration
  – Engagement of external organizations, especially external service developers

• Process
  – Open call in March 2019 and winner announcement in June 2019
Validation of the NeMo HyperNetwork

NeMo Hackaton

• Selection of 2 services
  – Pick&Pak: Car share & luggage share service proposed by Pooja Rangarajan
  – ChargeSharing solution proposed by e3Charge

• Final results according to Hackaton criteria
  – e3charge: 9/12
  – Pick and pack: 6.25/12
Evaluation activities in test sites

• 5 test sites with different scenarios

French test site
✓ Charge point booking
✓ eMobility report
✓ Itinerary planning

German test site
✓ Capability of NeMo hypernetwork
✓ Battery services
✓ Plug & Charge

Austrian test site
✓ Microgrid management
✓ Inter-roaming

Spanish test site
✓ Inter-operability
✓ Actor profiling services
✓ Booking services

Italian test site
✓ Itinerary planning
Evaluation activities in test sites
Italian test site

• Purposes of the itinerary planning
  – Navigation system with notifications to the driver
  – Courtesy assistant app to offer advantages to highway users

• Test description
  – 14 naïve users as drivers
  – Journey from CRF facilities to Bardonecchia
  – Evaluation of the complete service

• Main outputs
  – Service highly appreciated by the users
  – Easiness to visualize and book charging points
Evaluation activities in test sites

Austrian test site

• Purposes of the microgrid management
  – Optimizing the power costs for a high power charge point with stationary battery

• Test description
  – Simulation of 3 charge points in different locations (Vienna, Innsbruck, and Feldkirchen)
  – Measurement data from another funded project called SYNERG-E
  – Energy cost study considering different configurations

• Main outputs
  – Economic optimization up to 8% for a single charge point
Evaluation activities in test sites

German test site

• Purposes of the battery services
  – Offer new services related to the battery for end users
  – Improve exiting features of the BMS

• Test description
  – Simulation of end users, BMS and vehicle based on real data
  – Development of a specific device for testing the overall process

• Main outputs
  – Utility of the service highly appreciated
  – Complex topic to manage as standalone in vehicles today
Evaluation activities in test sites

French test site

- Purposes of the itinerary planning
  - Fetching vehicle data in a single way
  - Providing the best route to the driver based on charge points and EV real time data

- Test description
  - ACEA demonstration as concept of extended vehicle in CRF facilities
  - Participation of NeMo partners and an external OEM

- Main outputs
  - Utility of the service highly appreciated
  - Possibilities to link with many other services like charge point booking
Evaluation activities in test sites
Spanish test site

- Purposes of the actor profiling/brokerage services
  - Assisting end users choosing the right charging station in terms of availability and price
  - Avoiding system congestions due to high demand of specific resources

- Test description
  - Simulation of many users based on real data
  - Study of occupancy and collisions with/without broker

- Main outputs
  - Information highly appreciated by the end users
  - Possibilities to link with other services like EMPs apps or charge point booking
European Electromobility Test Drive

• Purposes of the test drive
  – Evaluate the inter-roaming protocol benefits in field
  – Route crossing several with different CPOs and EMPs
  – Dissemination event all along the test drive

• Test description
  – 2 test drives organized to evaluate the European charging context with/without inter-roaming
    • October 2017: 950km from Turin to Barcelona with 2 vehicles
    • May-June 2019: 5000km with 1 vehicle

First test drive route
European Electromobility Test Drive

• Second test drive in numbers
  – 1 electric vehicle
  – 14 drivers from 6 countries
  – 5000 km in total
  – 9 countries
  – 1 month duration
  – Stops in 4 major events and 5 NeMo pilot sites

• Main outputs
  – Significant improvement of driver satisfaction thanks to the interroaming protocol
Thank you! Any Questions?

Christophe Moure
Project Manager
EV & HEV / Powertrain
christophe.moure@idiada.com
FROM NeMo TO A BUSINESS ALLIANCE FOR ELECTROMOBILITY

Andrew Winder
ERTICO – ITS Europe
NeMo Final Conference and Exhibition
19th September 2019
The Business Alliance for ElectroMobility (BAEM)

Why?
• To build a solid future for the Hyper-Network and associated services after the project end via a self-sustaining business model.

Vision:
• To promote interoperability of electromobility services via participation in standardisation processes.
• To act as a central operational hub in Europe for all electromobility actors, offering intelligence and added value via a unique marketplace.
The Business Alliance for ElectroMobility (BAEM)

What and who?

• A not-for-profit membership association (legal entity) comprising NeMo partners and other actors

• Open to all relevant stakeholders (membership MoU and fee)

• The BAEM will ensure full exploitation of the NeMo Hyper-Network and services.
BAEM value proposition

**PROVIDE COMPETITIVENESS**
- Cost savings
- Enable business relations
- Europe wide

**EASE THE CREATION OF INNOVATIVE EMOBILITY SERVICES**
- Harmonized services to improve customer experience (Common Information Model)
- Gather actors to create added value services
BAEM customer/partner segments

- Charge Point Manufacturers
- Electromobility Service Providers
- IT Service Developers
- IT Cloud Platform Providers
- eRoaming Platform Providers
- Other Service Providers *(map / routing and navigation..)*
- Charge Point Operators
- Parking and Service Stations Providers
- Policy makers / Regulatory Bodies
- Authorities *(regional, road)*
- Energy actors
- Associations and Interest Groups
- Fleet Operators
- Logistics Companies
### BAEM value proposition for selected segments

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM</td>
<td>Add value to Customer data by giving access to Third Parties</td>
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<tr>
<td></td>
<td>Provide Advanced EV services embedded in the car</td>
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<tr>
<td>Charge Point Operators</td>
<td>Provide dynamic pricing to your customers based on traffic influence or local grid capacity</td>
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<td>Connection to EMSPs by OCPI or through eRoaming platform</td>
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<tr>
<td></td>
<td>State of the art EV services (booking, smart charging) and access to high level quality services</td>
</tr>
<tr>
<td>eMSP</td>
<td>Access to accurate ePOI Data in one click</td>
</tr>
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<td>Be able to develop Advanced EV services for customers (Itinerary planning, smart charging)</td>
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<tr>
<td>Energy players</td>
<td>Exploit EV charging to provide new services for grid stability and balancing purposes</td>
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<tr>
<td></td>
<td>Be able to provide your customers EV with tailored offers and dynamic pricing</td>
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<td>Introduce more flexibility in the grid</td>
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<tr>
<td>Navigation provider</td>
<td>Getting data from EVs and charging point to provide Advanced itinerary planning for customers</td>
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<td>Be able to get EV data from multiple OEM with the same structure</td>
</tr>
<tr>
<td>Public authorities</td>
<td>Provide incentives for your people (free tolls, parking)</td>
</tr>
<tr>
<td></td>
<td>Access to usage data to improve charging stations location</td>
</tr>
</tbody>
</table>
BAEM key activities

Key Activities

System Demonstration
  - Marketing & Sales

Training
  - Municipalities
  - CP Operators

Collect Data
  - from CPs
  - from end users

Support to customers
  - via email
  - Skype or hotline
  - on site visit

Upgrade & Maintenance
  - System upgrade
  - Operations
BAEM revenue streams and subscription models

- BAEM Subscribers:
  - Businesses
  - Individuals
  - Municipalities

- Subscription Fee:
  - Subscription fee to enter BAEM
  - (unlimited use of the platform)

- Transactions within BAEM platform:
  - Flat fee per transaction occurred within the ecosystem
  - Flat fee per transaction occurred within the ecosystem
  - Flat fee per transaction occurred within the ecosystem
  - Flat fee per transaction occurred within the ecosystem
Invitation to the BAEM

• Go to https://nemo-emobility.eu/nemo-forum/ and click on the tab “Join NeMo”

• Register your interest in joining the Hyper-Network as a developer, provider or user of services

• Join us in setting up the BAEM as a founder member, to ensure sustainable management of the Hyper-Network after September 2019
Thank you!

Andrew Winder
a.winder@mail.ertico.com
Coffee break