NeMo COMMON INFORMATION MODELS

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Rationale for 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
NeMo Key Objective

- 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
Common Information Model

• Models physical objects and data structures which are relevant for the use cases selected in the project
• Based on previous relevant work and integrates existing standards on information modelling related to electromobility
• Creates a consistent format for data to be available to others
Common Information Model

Standardized model for information sharing across the NeMo Hyper-Network

Implementation of the standardized CIM
Methodology

– Based on the 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
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
Vehicle Business Objects

- Information from different sources, for example Neutral Server and a NeMo service
- Battery
  - BatteryID, VIN, BatteryType, BatteryCapacity, SoC, SoH, BatteryFault, ChargeCompletionEstimatedTime, ChargingStatus
- Vehicle
Charge session Business Objects

• 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
Smart Charge Business Objects

• 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
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>Trip</td>
<td>This is the description of the planned next trip</td>
<td>1</td>
<td>M</td>
<td>complex “Trip”</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>VehicleLoad</td>
<td>This is the expected vehicle load (in kg) during the next trip.</td>
<td>1</td>
<td>O</td>
<td>double</td>
</tr>
</tbody>
</table>
## Examples

**UserChargeNeed**

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
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<tr>
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<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>
Marketplace Business Objects

- **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**
User Business Objects

- User
- UserProfile
  - Preferences, history, recurrent places and trips
- UserChargingPreferences
- UserDrivingPreferences
- UserAgenda
eMobility Reporting Business Objects

• 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
Vehicle preparation Business Objects

- FleetMobilityNeed
- VehiclePredictedEnergyNeed
- PreconditioningProfile
  - notifications for the preparation of vehicle functionalities
- VehicleFunctionNotification
EV Charging infrastructure

Business Objects

• Update of eMI³ specifications
• 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
Conclusion

- Common Information Models for electromobility business objects
- CIM will be updated as necessary during the project developments
- New services will generate and exchange data according to the CIM
- Data translators will enable the translation of data to the NeMo CIM
- Interoperability of electromobility services
Thank you for your time!
Any Questions?

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