NeMo Common Information Models

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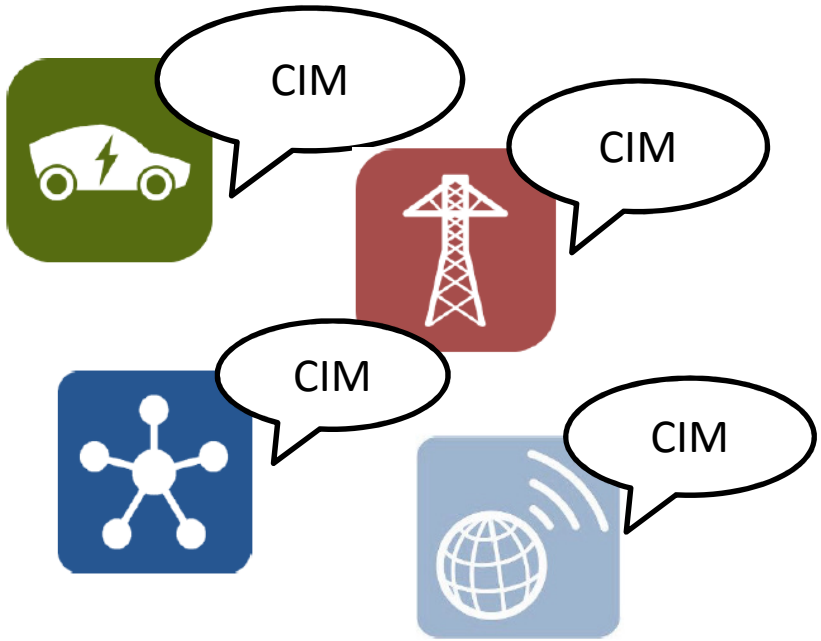
Rationale for the work

- 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 <u>common NeMo meta-language</u>



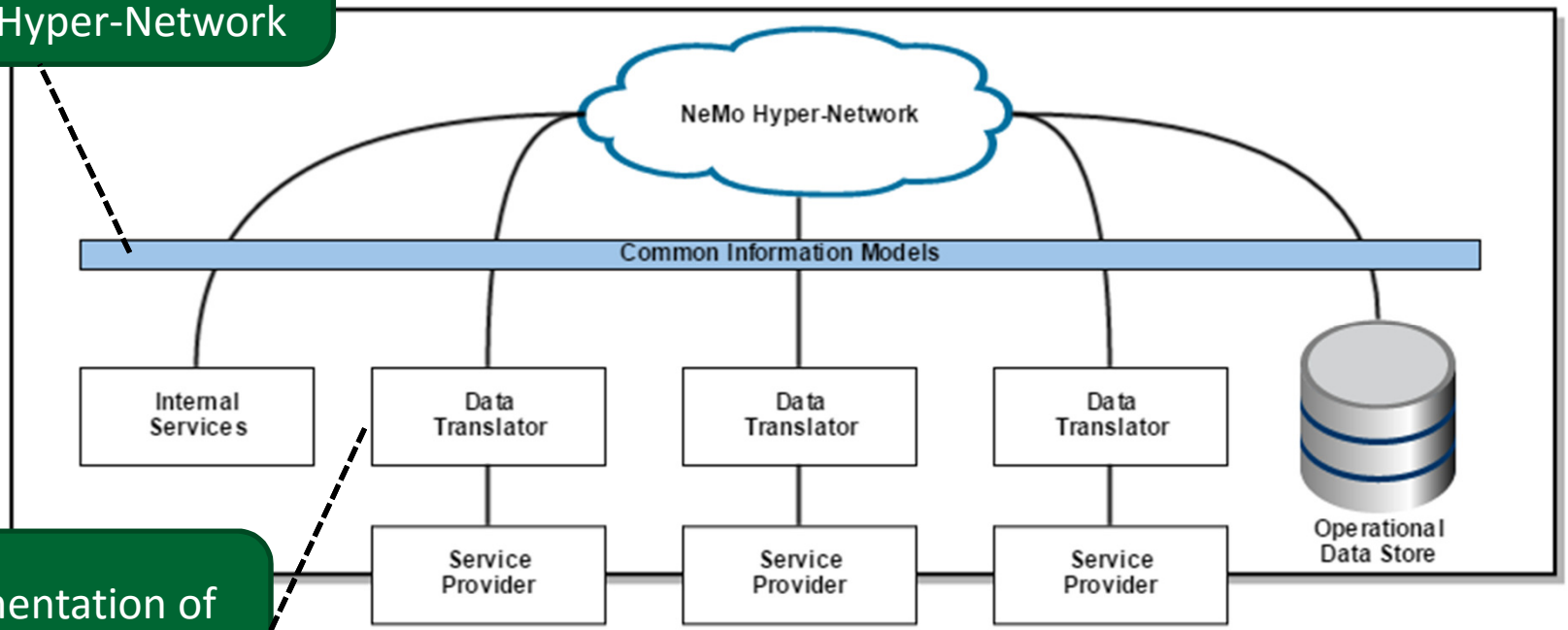
- Common Information Models (CIM)
- Data translators and common interfaces
- Smart Processing and Data Management algorithms

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 eMi^3 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
  - VIN, Manufacturer, VehicleModel, ChargingMode, MaxPower, VehiclePower, VehicleRange, VehicleSpeed, VehicleODO, VehicleConsumption, VehicleRemainingDistance, CurrentLocation, DestinationLocation, ExternalTemperature, VehicleHeatingStatus, VehicleACStatus, PreconditioningFunctionalities

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

ATTRIBUTE	DEFINITION	INST.	M/O	Format
eMAID	eMobility Account Identifier, as in ISO/IEC 15118.	1	M	string
RequestID	This is a unique identifier of the request	1	M	string
Trip	This is the description of the planned next trip	1	M	complex “Trip”
Vehicle	This is a reference to the description of the vehicle.	1	O	complex “Vehicle”
VehicleLoad	This is the expected vehicle load (in kg) during the next trip.	1	O	double

Examples

UserChargeNeed

ATTRIBUTE	DEFINITION	INST.	M/O	Format
eMAID	eMobility Account Identifier, as in ISO/IEC 15118.	1	M	string
RequestID	This is a unique identifier of the request	1	M	string
ItinerarySections	The list of itinerary sections that comprise the next trip	n	M	List of complex “ItinerarySection”
Vehicle	This is a reference to the description of the vehicle.	1	O	complex “Vehicle”
ItineraryEnergyNeed	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	n	M	List of double
TripEnergyNeed	This is the total energy need (in kWh) of the vehicle in order to complete the next trip	1	M	double

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 eMI^3 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

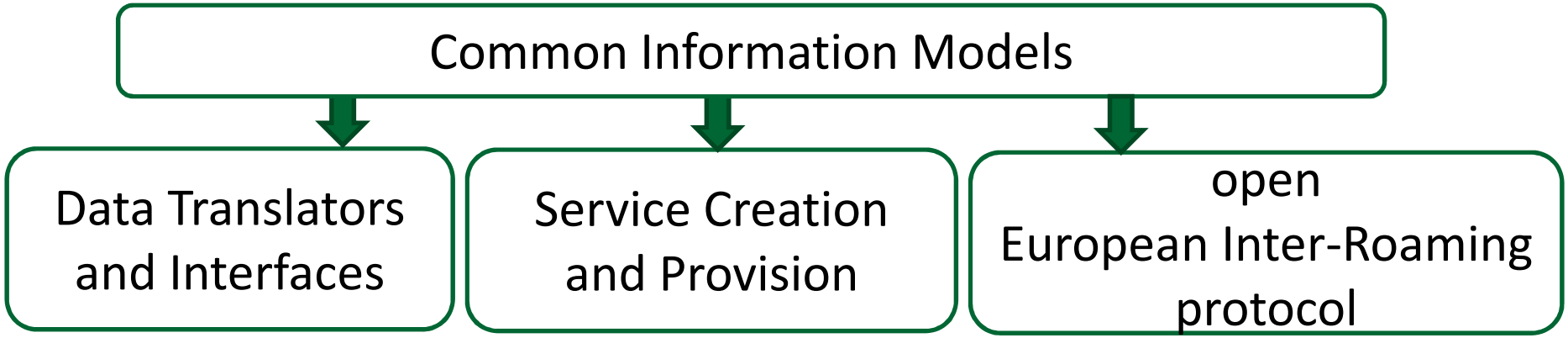
Support Objects

- 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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