NeMo Hackathon 2019: List of available services in the NeMo Hyper-Network

1. EV driver Auth services

The **authentication services** enable Hyper-Network users to manage user (client/driver) credentials. These services help service providers to provide their end users with a secure profile, in order that they can use active services in NeMo node. Authentication services are:

- Register EVDriver: to register new users to the system.
- Verify Register EVDriver: to complete the registration process of a user.
- Login EVDriver: returns tokens to be used in protected endpoints. In other to retrieve these tokens a valid email and password must be provided.
- Forgot Password EVDriver: allows users to change their current password by sending a recovery code to their associated email.
- Confirm Forgot Password EVDriver: Submit the code received by using the /auth/EVDriver/forgotPassword endpoint, and the new user desired password.

2. Service brokerage

Best Charging Options: Get a list of the estimated best chargers according to the availability forecast and the provided time and geo-coordinates. The returned list will contain a maximum of 5 ordered items: the first item is the one estimated to be the best.

3. EV Driver Monitoring and Profiling

Retrieve EVDriver Profile: Retrieves the entire profile of an EV Driver.

Post Track EVDriver: Send a track of raw geo-coordinates where the user has been. This will typically be used via a smartphone with the GPS enabled. This information is used to build the user profile.

4. CPO (Charge Point Operator) Monitoring and Profiling:

Charging Points: This method returns dynamic information of Charging Point(s). Currently the dynamic information consists of availability predictions. Optionally, the method can return the associated static data (profile information) of the Charging Point(s).

Charging Stations: This Post service returns profile information of Charging Station(s), including the associated Charging Points (EVSE) and Charging Connectors.

5. Personal Mobility Probability

This predicts the most probable route (by POI – point of interest) during the next 24 hours, including information about charge need, and visited charge points.

6. Load Forecasting

Service that forecasts the energy demand for EV charging for a station managed by a specific CPO, or for a larger area, based on historical consumption.

7. SoC (State-of-Charge) estimation

AdaptiveSoCEstimation aims to optimise the charging strategy such, that an optimal vehicle usability and intended vehicle use is achieved. This mainly focuses to avoid always charging the EV battery to 100% SoC, which enhances the short term usability but reduces battery lifetime. The service respects mobility demands and the driver as well as vehicle characteristics to estimate the required mission SoC. The service only provides a proposal to the battery. The EV and the Battery Management System (BMS) can agree or overwrite the proposal.

ImprovedSoCEstimation estimates the state of charge of an EV battery based upon the charging data as well as the mobility data of the vehicle. The system aims to respect the State of Health (SoH) of the battery. The service offers predictive SoC calculation, thereby useful for charging strategy alignment.

8. Battery services

BatteryCapacityCalculation: Based upon the charging data and the mobility data correlated to the SoC, the State of Health (SoH) of the battery of each EV will be estimated. The SoH is an expression of the maximum energy charging capacity of a battery and the accessible charging capacity. Knowing the behaviour of the SoH shall support services optimizing the battery life-time and enhance as well the usability estimation of the vehicle.

RemoteBMSParametrization: The service collects field information about specific battery types from various EVs and their operation. By analysis of the collected data, the service proposes an optimised and individualised parameterization for the BMS, mainly the parameters of the utilised battery models, but furthermore the charging of balancing strategy, if these can be influenced. The parameter update then will be performed via NeMo.

BatteryLoadManagement: Service management optimisation of load and operation conditions of the battery of an EV. Mainly it aims to avoid the battery staying at 100% SoC for longer time by programming an optimized charging profile or by applying optimised discharging strategies during operation by load prioritisation.

ThermalBatteryPreconditioning: Based upon estimated drive-off times, the service improves battery performance by initiating a thermal preconditioning of the vehicle before drive-off. The service continuously is able to adapt the thermal precondition planning by observing changes on the allocated mobility needs as well as by respecting driver preferences and environmental conditions (optional).

9. Grid services

MicroGridInfo: Provides near-real-time information about high-power charging stations. Metrics include static power/energy limits of the local micro-grid as well as dynamic limits depending on the current mode of operation of the micro-grid management system as well as the state of the local battery (State of Health, State of Charge,..). Furthermore a CPO can demand a forecast (estimate) of the cost of a given future (near-time) load profile at the charge point.

10. Electric Vehicle Supply Equipment (EVSE) / Charging Station services

Charging stations along route service: Finds charging stations along the route from a driver's origin to destination. The service returns a list of charging stations provided along a route from origin to destination and provides details regarding the charging stations such as location info, name, maximum power, contact details.

GetEVSEData: Web service used by a NeMo partner to get EVSE data (scope of the GIREVE e-roaming platform).

GetEVSEDynamicDataChanges: Web service used by a NeMo partner to get new dynamic status of EVSEs that have changed since a given date (scope of the GIREVE e-roaming platform).

GetEVSEStaticDataChanges: Web service used by a NeMo partner to get new definition of EVSEs that have changed since a given date (scope of the GIREVE e-roaming platform).

GetGeolocatedEVSEData: Web service used by a NeMo partner to get all EVSE located in a given perimeter defined by geo-coordinates and a given radius (scope of the GIREVE e-roaming platform).

11. Remote EV services

RemoteStartCharge: Web service used by an Electromobility service provider (EMSP) to start charge remotely on a charging point.

RemoteActionRequest: Web service used by an EMSP to send actions relative to a charging session. (stop, charge, …)

GetChargeDetailRecords: Web service used by an EMSP to get Charge Detail Records (CDRs) relative to charges of its customers on charging points of CPOs.

List of abbreviations and acronyms

Abbreviation	Meaning
BMS	Battery Management System
CDR	Charge Detail Record
CP	Charge Point
CPO	Charge Point Operator
EMSP	Electro Mobility (service) Provider
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
GIREVE	French-based electro-mobility roaming platform ("eRoaming provider) and NeMo project partner - www.gireve.com/en
GPS	Global Positioning System
NeMo	Hyper-Network for electroMobility
POI	Point of interest
RFID	Radio-frequency identification
SoC	State of Charge
SoH	State of Health