BUSINESS AND TECHNICAL DEMONSTRATIONS OF THE NeMo HYPER-NETWORK

Thomas Walz

Technical Relations Executive
IBM Germany
Final Conference and Exhibition
19th September 2019
AGENDA

Using the Hyper-Network: Access and business features of the NeMo Marketplace

- Recap NeMo Hyper-Network Architecture and current deployment
- NeMo partner type and partner & user roles
- How to join the NeMo as “full” or “associated” partner
  - Process and UI
- The NeMo Marketplace - Access & features
  - Marketplace login and navigation overview
    Important Information (Role, Node, Partner Type Navigation Tabs ... )
    - How to search for a service
    - Service info
      Overview on
      Service registration, Service offering, Service contracting
- Monitoring the nodes with IBM Sysdig
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

- Low-Level Service Finder
- Integration Bus
- Low-Level Service Optimizer
- Service&Contract Registry Backend
- Node.js Runtime
- Service&Contract Registry Blockchain
- HyperLedger
- S&C Registry DB

NeMo Peer Node

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

Service Developer

Technical Admin, Service Operator
Offering Manager, Contract Manager
Business Administrator

Translation Specification

Translator (from/to CIM)
AGENDA

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Roles of partners in the NeMo business network

**NeMo partner Types**

- Full NeMo Partner
  - Marketplace participant – operates a NeMo Node
- Affiliated NeMo partner
  - Marketplace participant – accesses NeMo features via full partner’s NeMo Node

**NeMo partner Roles**

- NeMo Governance
  - can create/update/delete a Business Partner (BP)
- Service Provider
  - can register services and publish commercial offerings for their services
- Service Consumer
  - can sign Service Contracts based on available Offerings
- Offerings Regulator
  - can see ServiceContracts signed by parties
- Service ProSumer
  - can act like Service Provider + Service Consumer
Roles of users in the NeMo business network

Activities of users of the NeMo Marketplace for e-mobility IT Services

<table>
<thead>
<tr>
<th>Role</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Administrator</td>
<td>manages NeMo account of a Business Partner (BP)</td>
</tr>
<tr>
<td>Service Developer</td>
<td>implements and registers NeMo services</td>
</tr>
<tr>
<td>Offering Manager</td>
<td>maintains the service offerings of a BP</td>
</tr>
<tr>
<td>Contract Manager</td>
<td>manages the service contracts of a BP</td>
</tr>
<tr>
<td>Technical Administrator</td>
<td>The super user of a BP; - node installation and operation; - all what the others can do</td>
</tr>
</tbody>
</table>
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How to join NeMo as ”full” or “associated” partner

Application Process:

– Contact NeMo Coordinator (see Website: https://nemo-emobility.eu/nemo-forum/)

– Bilateral discussion with NeMo Coordinator and your partner in case of “affiliated” partner approach

– Sign Memorandum of understanding

– Get registered

– Install NeMo Node
  • Or get access via full partner node
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How to join NeMo as ”full” or associated partner – See NeMo UI

- NeMo coordinator adds new Business partner
  - Full or associated
How to join NeMo as “full” or associated partner – See NeMo UI

- NeMo coordinator adds new Business partner
  – See form

Enter Partner details
How to join NeMo as “full” or associated partner – See NeMo UI

- NeMo coordinator adds new Business partner
  - See form
**NeMo Marketplace - Login**

![Login Page](image)

**Login info from add contact**

---

**IBM Deutschland GmbH**

**Persons**

<table>
<thead>
<tr>
<th>Info</th>
<th>Additional IDs</th>
<th>Addresses</th>
<th>Persons</th>
<th>Services</th>
<th>Service Offerings</th>
<th>Contracts (SELLER)</th>
<th>Contracts (BUYER)</th>
<th>NeMo-Nodes</th>
</tr>
</thead>
</table>

**Marketplace**

<table>
<thead>
<tr>
<th>Surname</th>
<th>Firstname</th>
<th>Role</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas</td>
<td>Walz</td>
<td>Technical Administrator</td>
<td><img src="image" alt="Contact" /></td>
</tr>
<tr>
<td>Peter</td>
<td>Kim</td>
<td>Technical Administrator</td>
<td><img src="image" alt="Contact" /></td>
</tr>
</tbody>
</table>

---

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# NeMo Marketplace - Navigation

## Tab navigation

<table>
<thead>
<tr>
<th>Business Partners</th>
<th>Services</th>
<th>Service Offerings</th>
<th>Service Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marketplace</strong></td>
<td><strong>Business Partners</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SMA</strong></td>
<td>Charge point operator and E-mobility service p...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FKA</strong></td>
<td>As a research partner for the automotive indu...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IBM</strong></td>
<td>IBM Deutschland GmbH participating in the N...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MOSAIC</strong></td>
<td>Mosaic Factor SL is an SME specialized in inn...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CRF</strong></td>
<td>Centro Ricerche Fiat</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GIREEVE</strong></td>
<td>French eRoaming platform operating in Europe.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ICCS</strong></td>
<td>ICCS represents the ‘NeMo Alliance’ authority ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POLIBA</strong></td>
<td>The Polytechnic of Bari is an Italian public sci...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NeMo Marketplace – Role info

Node Role = Service ProSumer at IBM Node

User Role = Technical Admin
NeMo Marketplace – How to search for a service

Via „Services“ Tab

Enter search text – will filter on Name, Category – Searching for eRoomaing

Select Service of interest
NeMo Marketplace – View service details
– GetLocations SOAP Service

Service Type: SOAP

Specification URL

Semantic description
Service Type: WebService

Specification URL e.g. YAML

Semantic description : OWL file

Access Ctrl info: API Key

NeMo Marketplace – View service details – IBM Trustee REST Service
### Service Offerings

#### Search for Offerings by Gireve

<table>
<thead>
<tr>
<th>Business Partners</th>
<th>Services</th>
<th>Service Offerings</th>
<th>Service Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EVCI data download service</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>This is an EVIC offer to get EVCI data</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Active: GIREVE</td>
<td></td>
</tr>
</tbody>
</table>

« Previous 1 Next »
NeMo Marketplace – Select offering

Service info regarding active and dates offering

Service offering for service GetLocation

Here we have 2 variants to select from
NeMo Marketplace – Signing a Service contract

**Sign Contract**

**Offer Details:**
EVCI data download service
This is a commercial offering to get EVCI data
It is created in 17/09/2018 and is valid from 05/10/2018 through 30/10/2018.

**Estimated monthly price:** 0 EUR

**Fill in the Contract Details:**
* Required fields

- **Contract ID**
  - My Contract 1 with Grieve GetLocation Service

- **Name**
  - GrieveGetLoc

- **Description**
  - Needed for application xzzy

- **Valid from Through**
  - Mon Sep 02 2019 11:25:36 GMT+0200 (CEST)

**ACCEPT Button becomes active to sign contract**

**Sign Button on Service Details**

Enter contract Info relevant for you
NeMo Marketplace – Signing a Service contract

**Sign Contract**

**Offer Details:**
- EVCI data download service
  - This is a commercial offering to get EVCI data.
  - It is created in 17/09/2018 and is valid from 01/09/2018 through 30/09/2018.
- Estimated monthly price: 0 EUR

**Fill in the Contract Details:**
- **Required fields**
  - Contract ID
  - Name
  - Description
  - Valid from
  - Valid through

**Sign Button on Service Details**

**Enter contract Info relevant for you**

**ACCEPT Button becomes active to sign contract**
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IBM Cloud™ Monitoring with SysDig

• Operational visibility into the
  – Performance and
  – Health of the applications and services
• Full stack telemetry
  – Auto-collects metrics and events from various containers
• Alerts
• Notifications through channels
  – Email
  – PagerDuty
  – Slack
• View and design dashboards
• Explore entire environment
NeMo SysDig Dashboard

Explore

By tag, node, and container name

Search environment

Scope: Entire Infrastructure

Segment by proc.name

Avg. CPU % 6.01%
Avg. Memory Usage % 39.9%
Avg. Network Bytes 31.4 KiB/S
Avg. Network Connections 23.6/s
Avg. Disk Usage 60.8%
Avg. File Bytes Total 484 KiB/S

CPU %

Memory Usage %

Network Bytes Total

Number of Network Connections

File Bytes Total

Back to Explore Table

LIVE: 11:40 am - 12:40 pm (1 H)
Thank you!

Thomas Walz
- Technical Relations Executive
IBM, Germany
Thomas.Walz@de.ibm.com
REGISTRATION OF AN ATOMIC OR HORIZONTAL SERVICE OFFERING AND CONTRACTING

Thomas FOUSSÉ

Project manager
GIREVE
Final Conference and Exhibition
19th September 2019
Register a NeMo service
Register a NeMo service

Endpoint

GIREVE

Get Locations Service
Register a NeMo service

Service creation tool

NeMo Hyper-Network

Gitlab

Semantic Description

Get Locations Service

GIREVE
Register a NeMo service

NeMo Hyper-Network

Gitlab

Mapping description

GIREVE

Get Locations Service

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## Register a NeMo service

<table>
<thead>
<tr>
<th>Name</th>
<th>Geolocations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Geolocations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
<th>Web Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Web Service Endpoint**
https://ecpi-pg-tpg.gireve.com/ecpi/gpe/2.1/locations

**Specification URL**
https://issuse-ziifton.iccs.gp/gireve/artifacts/ranw/9319a8718sec9c9c4f6a1125z02502a9a67c1/NeMo_Service_Files_For_Demo/Gireve_REST

**Test Instructions URL**
https://issuse-ziifton.iccs.gp/gireve/artifacts/ranw/instr/9319a8718sec9c9c4f6a1125z02502a9a67c1/NeMo_Service_Files_For_Demo/Gireve_REST - Mapping.xml

**Assets URL**
https://issuse-ziifton.iccs.gp/gireve/artifacts/ranw/master/NeMo_Service_Files_For_Demo/Gireve_REST

**Semantic Description URL**
https://issuse-ziifton.iccs.gp/gireve/artifacts/ranw/sec/9319a8718sec9c9c4f6a1125z02502a9a67c1/NeMo_Service_Files_For_Demo/Gireve_REST

**Category**
**eRoaming**

<table>
<thead>
<tr>
<th>Average Response time in milliseconds</th>
<th>Average availability in percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Authentication Type**
**Token**

**Invocation Method**
**GET**

**Invocation Count**
Atomic: true
Request a NeMo service

Request in CIM language

NeMo Service consumer

NeMo Hyper-Network

Translators

Request in proprietary language

GIREVE

Get Locations Service

Request a NeMo service
Request a NeMo service

NeMo Service consumer

NeMo Hyper-Network

Translators

Response in CIM language

Response in proprietary language

GIREVE

Get Locations Service
Request a NeMo service

NeMo Hyper-Network

NeMo Service consumer

Response in CIM language

Response in proprietary language

GIREVE

Get Locations Service
Create a service offer

Name
EVCI data download service

Description
This is a commercial offering to get EVCI data

Status
Active

Creation Date
17/09/2018

Valid from/Through
09/10/2018 - 31/10/2018

Currency
EUR

Billing Period
Monthly

Service(s) linked to this offer

Sections List:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Topic</th>
<th>Type</th>
<th>Charging Unit</th>
<th>Actions</th>
<th>Variants</th>
</tr>
</thead>
<tbody>
<tr>
<td>French Charge Infrastructure data</td>
<td>Service to get French EVCI data</td>
<td>EVSE data</td>
<td>Defining</td>
<td>CP Location Request</td>
<td></td>
<td>Name</td>
</tr>
<tr>
<td>Refresh every month</td>
<td>You can retrieve data one time per month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Refresh every week</td>
<td>You can retrieve data one time per week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Refresh every day</td>
<td>You can retrieve data one time per day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>German Charge Infrastructure data</td>
<td>Service to get German EVCI data</td>
<td>EVSE data</td>
<td>Descriptive</td>
<td></td>
<td></td>
<td>Name</td>
</tr>
<tr>
<td>Refresh every month</td>
<td>You can retrieve data one time per month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Thank you!

Thomas FOUSSE
GIREVE
COMPOSITE SERVICE CREATION

Nils Masuch
Technical University Berlin
Final Conference and Exhibition
19th September 2019
Agenda

• Overview Service Creation Tools
• Composite Service Creation
• Deployment & Testing
• Service Description Modelling
Overview Service Creation Tools

NeMo Tools for Service Creation

NeMo (EMP) Business Partner Data Center

Service Artifacts Server

- Semantic CIM Model
- Semantic Service Descr.
Overview Service Creation Tools

NeMo Tools for Service Creation
- Semantic Description Tool
- Service Finder Tool
- Service Composition Editor
- Service Process Management
- Service Testing

NeMo (EMP) Business Partner Data Center
- BPMN Runtime

Service Artifacts Server
- Semantic CIM Model
- Semantic Service Descr.
- Complex Services (as BPMN)
- Low-Level Service Finder
- Low-Level Service Optimizer
Overview Service Creation Tools
Composite Service Creation – Actor/Use Case Creation

[Image of a diagram showing a flowchart with nodes labeled Service Orchestration, 1 Pool, FKA, Gieve, and Poliba.]

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Composite Service Creation – Example Use Case

Service “Estimate Mobility Demand”

Service “Optimize Battery Charging Strategy”

Service “Infrastructure Information”
Composite Service Creation – BPMN Process Editor

![Composite Service Creation – BPMN Process Editor](image-url)
Composite Service Creation – Search Service
Composite Service Creation – Search Service
Composite Service Creation – Search Service

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Composite Service Creation – Process Integration & Finalization
Composite Service Creation – Process Integration & Finalization
Service Process Deployment
Service Process Testing
Service Modelling – CIM Model

- Common Information Model to describe services within NeMo
- Available in different representation languages
- For semantic descriptions, Web Ontology Language (OWL) format is used
Service Modelling – Description Tool

• Define all relevant parameters, such as Input, Output, Preconditions, Effects
Service Modelling – Description Tool

- Define all relevant parameters, such as Input, Output, Preconditions, Effects
- Comes along with a rule editor to specify restrictions under which circumstances a service is invokable
Conclusion

• Composite service has been created, tested, described and deployed

• Next steps:
  – create translation file between proprietary model and CIM model (next presentation)
  – register service at marketplace (shown before)
  – Invoke service from outside the Service Creation Tools (next presentation)
Thank you!

Nils Masuch
Technical University Berlin
SERVICE EXECUTION, WITH FOCUS ON INTEGRATION BUS AND TRANSLATORS

Thodoris Theodoropoulos
ICCS
Final Conference and Exhibition
19th September 2019
Agenda

• NeMo-wide execution system architecture
• Service invocation
• Composite service invocation
Service-to-service invocation enabled by Integration Bus

Replication & Consensus on Services & Contracts via Hyperledger
NeMo-wide execution system architecture

- REST API call reception
- Access control
- Service lookup
- Service routing

- Service translation
- Service invocation
API call reception

• The chain of requests starts here
• Developer friendly interface to familiarise with API calls (Swagger)
• Receive the API call on the consumer side
• API call is formatted in CIM (Common Information Model)
  – Promotion of interoperability
Access control

- IDAM (Identity access management) service on each node ensures access to local NeMo node instance
- OAuth 2.0 access control ensures access on the basis of a valid client-id and client secret.

1. Create client application credentials
2. Receive credentials
3. Provide them to the client application
4. Invoke IDAM with client credentials
5. Receive token
6. Provide token to the integration bus
7. Check that the token is ok
Service lookup-rooting

- Lookup service in the registry-marketplace
- Find out the producer’s NeMo node IP
- Forward the call through a secure connection (via mutual TLS)
  – Only trusted NeMo nodes can reach each other!
Service translation

• Before execution
Service translation

• CIM model of the request body is translated to a proprietary model before invoking the service
• Proprietary model is translated to a common information model after invoking the translator
• Inventory of multiple objects
Service invocation

- Service is finally invoked on the provider side.
- Response is backwardly propagated through the network.
- Both REST and SOAP invocation type supported.
- Multiple service authorisation types supported.
Composite service invocations

- API call made through the respective integration bus interface
- BPMN engine processes the call and invokes it
- Demo; Three service composite service
  - Get charging point locations
  - Estimate the SoC required to fulfill a given trip
  - Estimate the most probable charging stops according to historical profile and the initial SoC
Node Invocations

Client app

Consumer Integration bus

Get Locations (Provider node)

Adaptive SoC (provider node)

Charging stops (provider node)
Thank you! Any Questions?

Thodoris Theodoropoulos
ICCS
NEUTRAL SERVER AND EXTENDED VEHICLE STANDARD INTEGRATED WITH THE NeMo INFRASTRUCTURE

Roberto Tola
Centro Ricerche Fiat, Italy
Final Conference and Exhibition
19th September 2019
Beginning of NeMo

NeMo

NeMo added value services

Improved nav experience

EV owner

Extended Vehicle

OEM backend

EV Data

CRF
CRF Reference architectures

End of NeMo
IBM Neutral Server a.k.a. “Trustee”

Motivation

Uprising lack of standardization

Neutral Server aka Trustee
(compliant with General Data Protection Regulation)
Main objectives

• Propose a real use case that impacts the EVs context
  – Prove the feasibility of the use case with the actual technology making evident the values for the users

• Integrate the OEM (FCA) with Trustee
  – Try the technology of Neutral Server/Trustee server, validating the related model

• Have a reusable result within NeMo context
  – Implement a use case reusable and compliant with NeMo context
The CRF/IBM Trustee PoC

**Approach**

*Focused on the fulfilment of the EU “guiding principles” and on Data Privacy with its “double consent” approach*

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

1. **Product/Service Offer**
2. **Acceptance of product/service offer including data transfer from OEM via Trustee to Third Party**
3. **Consent to transfer data to unknown Third Party via Trustee**

Driver / EV owner
Overall architecture
Italian test site scenario

- Contract signature (app)
- Double consent (portal)
- Trip Starting (simul)
- CP2 booking (app)
- Road works queue (simul)
- Battery low warning (app)
- CP rebooking (from CP2 to CP1)
- Battery Recharging (simul)
- End of trip (simul)
The EV
The HMI
Charging points

Susa - TecnoSitaf

IRETI - IREN
The CourtesyAssistant app

![Images of the CourtesyAssistant app screens]
Thank you! Any Questions?

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Project Manager
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Roberto.tola@crf.it