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Session 5C: Standardization

GLOBAL SERVICE PROVIDER FOR ELECTRIC VEHICLE ROAMING

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What is roaming?

- the term originates from wireless telecommunications

extension of connectivity service in a location that is different from the home location where the service was registered. Roaming enables to access services when travelling outside the geographical coverage area of the home network by means of using a visited network.
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ROAMING IN TELECOMMUNICATIONS

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Wireless TeleComm Service Provider

Mobile Phone User

Visited network

Roaming Contract

Home network

Wireless TeleComm Service Provider
• **Sufficient coverage with charging infrastructure operated by a single Charging Service Provider (CSP):**
  - not to be expected in large geographic areas
  - business approach of different CSPs
  - competition shall be enabled

• **Number of EVs and intensity of their use will increase**

• **Range of EVs will increase**
ACTORS IN ELECTRIC VEHICLE CHARGING

- **EV User**: charges the EV at Electric Vehicle Supply Equipment (EVSE)

- **Charging Service Provider (CSP)**: operates the “home” network of Electric Vehicle Supply Equipment (EVSE) and makes contracts with EV Users

- **Electric Mobility Service Provider (EMSP)**: makes contracts with EV Users and EVSE Operator(s)

- **EVSE Operator**: operates the EVSE and makes contracts with EMSPs to enable their EV Users to charge the EVs at its EVSE

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MULTIPLE EVSEOs AND EMSPs

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Global Service Provider (GSP)

EVUser m

EV User 2

EV User 1

EVSEO 1

EVSEO 2

EVSEO n

EMSP m

EMSP 2

EMSP 1

EVSEOs and EMSPs network

EVSEOs and EMSPs network

EVSEOs and EMSPs network

EVSEOs and EMSPs network

EVSEOs and EMSPs network

EVSEOs and EMSPs network

EVSEOs and EMSPs network
• EV User’s identification at EVSE
• Request for charging authorization: charging allowed?
  o Verification of EVSE availability
  o Verification of EV User’s contract (on the “white list”?)
• Reply to EVSE: start / deny charging
• Stop charging → send invoice for service to EMSP
• **Verification of EV User’s contract: who is the EV user?**
  o The EV User and the EVSE Operator do not have a contract! The EV User has a contract with EMSP

• **Who is the EV User’s EMSP?**
  o The EVSEOs and the EMSPs do not have a direct contract!

They exercise the roaming services through the GSP
For identification of EV user several methods can be applied:

<table>
<thead>
<tr>
<th>Method applied</th>
<th>EV User’s identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID, NFC, communication EV-EVSE</td>
<td>EV User’s ID determined by the EMSP</td>
</tr>
<tr>
<td>SMS, SmartPhone Apps</td>
<td>EV User’s phone number</td>
</tr>
<tr>
<td>Credit, debit cards</td>
<td>Card’s number</td>
</tr>
<tr>
<td>Pay-As-You-Go (on the spot payment)</td>
<td>No identification needed</td>
</tr>
</tbody>
</table>

- Only the first method enables the direct extraction of EMSP’s identity from the EV User’s identifier
- Other methods require introduction of “translation table” at the GSP to connect the EV Users’ identifiers with their EMSPs
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STRUCTURE OF GSP’s ICT SYSTEM

SW developed within the ICT4EVEU project

EMSP/EVSEO contracts
<table>
<thead>
<tr>
<th></th>
<th>EMSP</th>
<th>EMSP</th>
<th>EMSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>n</td>
<td>X</td>
<td>O</td>
<td>X</td>
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</tbody>
</table>

EV user identifiers → EMSP translation table

<table>
<thead>
<tr>
<th>EV User Identifier</th>
<th>EMSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone no. 1</td>
<td>EMSP 1</td>
</tr>
<tr>
<td>Credit card no.</td>
<td>EMSP 1</td>
</tr>
<tr>
<td>Phone no. x</td>
<td>EMSP x</td>
</tr>
</tbody>
</table>
• Implementation of hierarchical structure of GSP:
  o A single GSP covers the actors (and EV User’s) on a certain geographical area (region)
  o Higher level GSPs (national, international) may be introduced to connect different GSPs and enable roaming in wider area

• Financial clearing:
  o In the presented solution the billing procedures between the EVSEOs and EMSPs are executed on a bilateral level (not via the GSP)
  o In the future, the GSP may assume also a function of financial clearing and settlement
  o Upgrade of GSP’s legal status needed (permission to execute financial activities)
  o Implementation of rigid security and safety standards in communication
• EV User’s identifiers:
  o The use of commonly agreed identification methods and structure of EV User’s IDs would facilitate the interoperability between the different GSPs (regional, national, international)
  o The EV User’s ID should be “world wide unique”
  o The EV User’s ID should contain a unique EMSP code
  o With implementation of such IDs the EV Users – EMSPs translation tables are not needed (and also a storage of large amount of data on EV Users at different GSP levels)
Verification of EV User’s contract validity: where to store (and verify) the “contract status” data?

- EVSE
- EVSE Operator
- Global Service Provider
- EMSP

Verification process:
1. EVSE asks Global Service Provider
2. Global Service Provider verifies and returns the status
3. EMSP updates the status
4. EVSE operator checks the status

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