V1.1 Electric Vehicle ICT Interface Specifications Part 1 Use Cases

Version number:	Version 1.1
Date:	26/11/2018
Author:	eMI^3

eMI³ AISBL c/o ERTICO – ITS Europe, 326 Ave Louise, Brussels, Belgium
+32 (0) 2 400 07 00
www.eMI3group.com

Page left intentionally blank

Version Control

Version history			
Version	**Date**	**Main author**	**Summary of changes**
0.1	17/02/2014	Silvio Weeren	First draft with structure
0.2	03/03/2014	Silvio Weeren	Structure adapted after GA
0.3	07/03/2014	Silvio Weeren	Agreed structure after meeting 07/03/14
0.4	17/03/2014	Silvio Weeren	With input from meeting 14/03/14
0.5	26/03/2014	Silvio Weeren	With input from meeting 24/03/14
0.6	02/04/2014	Silvio Weeren	Updates from Silvio & Ludovic
0.7	15/04/2014	Silvio Weeren	Updates from Silvio & Ludovic
0.72	28/04/2014	Silvio Weeren	After reviews 24th, 25th, 28th
0.8	28/04/2014	Silvio Weeren	Equal to 0.72 but all changes accepted for IPR review
0.85	10/06/2014	Silvio Weeren	Updates with T&D, etc
0.9	06/11/2014	Silvio Weeren	Final draft
0.91	30/11/2014	Ludovic Coutant	Updates Use Cases part with current state of work
0.92	04/12/2014	Paul Bertrand	Cleaned up the reference section.
0.93	14/12/2014	Marco Marijewycz	Final document review
0.94	19/12/2014	Luis Reis	Update of “General Overview”
0.95	21/12/2014	Marco Marijewycz	Finalised document for GA review
0.96	22/12/2014	Marco Marijewycz	Revision to Use Case Chapter
0.97	22/12/2014	Sebastien Albertus	Compilation of first comments
0.98	21/01/2015	Luis Reis, Ludovic Coutant, Marco Marijewycz	Review of member comments
0.99	19/02/2015	Ludovic Coutant	Addition of annexes with UCs and UCEs
1.00	16/03/2015	Marco Marijewycz, Luis Reis	Review and update of “Terms and definitions” Revision
1.1	26/11/2018	Ludovic Coutant, Gilles Bernard	New UCEs introduced: Smart Charging and Electricity Roaming
	Name		**Date**
Prepared	Marco Marijewycz, Luis Reis		31/08/2015
Reviewed	eMI3 Steering Board		30/09/2015

Authorised	eMI3 Steering Board	30/09/2015
Authorised	eMI3 Steering Board	07/12/2018

Circulation	
Recipient	**Date of submission**
Public	16/11/2015
Public (eMI3 website)	11/12/2018

Authors

Silvio Weeren, IBM Deutschland

Ludovic Coutant, CNR

Arnaud Cuisson, CNR

Gilles Bernard, Afirev

Ton Karelse (Allego)

Jan Wieling (Allego)

Jörg Seiffert (E-On)

Joury De Reuver, ChargePoint

Luis Reis, CEIIA

Paul Bertrand, EDF

Bennett Marks, Nokia

Thomas Gereke, Siemens

Thomas Stiffel, Bosch

Kai Weber, Bosch

Marco Marijewycz, E.ON

Laurent Bloch, Schneider-Electric

Simon Schilling, Smartlab

Joost Laarakkers, TNO

Table of contents

Figures

Tables

Notice and Disclaimer

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

eMI3 standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While eMI3 administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

eMI3 disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. eMI3 disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfil any of your particular purposes or needs. eMI3 does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, eMI3 is not undertaking to render professional or other services for or on behalf of any person or entity, nor is eMI3 undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

eMI3 has no power, nor does it undertake to police or enforce compliance with the contents of this document. eMI3 does not certify, test, or inspect products, designs, or installations for safety or health purposes, this might change in the future. Any certification or other statement of compliance with any health or safety–related information in this document shall not be attributable to eMI3 and is solely the responsibility of the certifier or maker of the statement.

Introduction

This specification was developed in accordance with the procedures of the eMI3 group. This group has been formed to enable global Electric Vehicle (EV) services interoperability by harmonizing existing and preparing standardization of future ICT data standards & protocols including security and privacy. This document provides an overview of the specifications provided and planned serving a specific goal to support the EV industry to drive broader EV adoption and to facilitate the creation of advanced services for a seamless EV driver experience. These specifications are a result of input from various stakeholders (via liaison or membership of eMI3). These stakeholders include EV driver communities, governmental/regulatory bodies, standards development organizations, EV charging network service providers, Electric Vehicle Supply Equipment[1] (EVSE) manufacturers, OEMs and electric utilities.

Each member remains free to adopt protocols and technology best suited for its own service goals, internal architecture, and business requirements. This approach respects the system, administrative, and organizational boundaries inherent in any diverse collection of independently operated networks, while allowing each network to innovate and provide consumer value. By addressing interconnection at the network level rather than device level, system scaling is greatly improved and interoperation is simplified by having a smaller number of hierarchically organized interconnection points

The following parts will be described in this document:

1. General Overview
2. Use case description

Over the last few years Electric Vehicles adoption has been growing significantly. To support this new market, several new market roles emerged incl. EV Services Providers (EVSP), Electric Vehicle Supply Equipment Operator (EVSE Operator), Third party service providers and EV marketplaces. This also creates the need for interoperability, roaming, driver services and efficient management amongst these specific roles.

The final definition of these Use Case descriptions will potentially result in additional interface and protocol specification further use case descriptions will be published on http://emi3group.com,

[1] Including charging stations and charging points.

Scope

This eMI3 specification (industry standard) consists or will consist of the following parts which may be extended in the future.

- Part 1: General overview & Use Cases
- Part 2: eMobility Business Objects and related Unique Identifiers (incl EVSE Attributes)

All parts of the eMI3 specification are deemed to be independent and self-contained.

Conformance

This document contains “conformance statements”. Conformance statements are assertions about how implementations of the specification must act in order to claim adherence to the standard. Conformance statements follow the best practice recommendations laid out in RFC 2119 [RFC2119]. The capitalized key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

Conformance to this specification may be claimed if all “MUST”, “MUST NOT”, “SHALL”, “SHALL NOT” and “REQUIRED” requirements are met.

References

Normative References

[RFC2119] “Key Words for Use in RFCs to Indicate Requirements Levels”, S. Bradner, 1997, https://www.ietf.org/rfc/rfc2119.txt

Informative References

IEC 61850-7-420	Communication networks and systems for power utility automation
IEC 61851-1	Electric vehicle conductive charging system – General requirements
IEC 61851-21	Electric vehicle conductive charging system – Part 21: Electric vehicle requirements for conductive connection to an a.c./d.c. supply
IEC 61851-22	Electric vehicle conductive charging system – a.c. electric vehicle charging station
IEC 61851-23	Electric vehicle conductive charging system – d.c electric vehicle charging station
IEC 61851-24	Electric vehicle conductive charging system – Control communication protocol between off-board d.c. charger and electric vehicle
ISO/IEC 7498-1	Information processing systems -- Open Systems Interconnection -- Basic Reference Model - Part 1: The Basic Mode
ISO/IEC 7498-2	Information processing systems -- Open Systems Interconnection --Basic Reference Model -- Part 2: Security Architecture
ISO/IEC 7498-3	Information processing systems -- Open Systems Interconnection –Basic Reference Model - Part 3: Naming and addressing
ISO/IEC 15118 Parts 1–8	Road vehicles – Communication protocol between electric vehicle and grid
ISO/IEC 27000	Information technology – Security techniques – Information security management systems – Overview and vocabulary

ISO/IEC 27001	Information technology – Security techniques – Information security management systems – Requirements
CEI/TC8/WG6/DCT8	Electric transportation to Grid Communication protocol

Terms, Definitions and Abbreviations

The terms, definitions and abbreviations relevant to all eMI3 documents are available on http://emi3group.com/

They can also be found in the following document:

"Electric Vehicle ICT Interface Specifications: Terms, definitions and abbreviations":

eMI3-standard-TermsAndDefinitions-v1.4.pdf

1 General overview

eMI3's scope includes all ICT interfaces, application level protocols and standardized software services supporting all required business models and platforms of the stakeholders within the EV market. As illustrated in Figure 1, electric mobility constitutes a complex ecosystem, including energy systems, cities (comprising urban management, transportation systems and other), where infrastructure and an array of EV related services emerge and vehicle manufacturers and service players interact with one another.

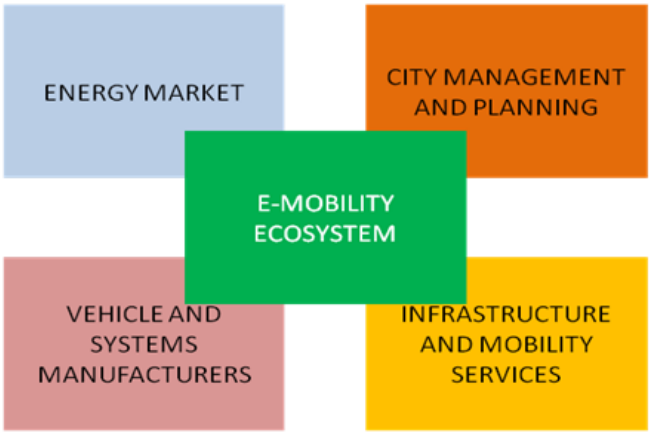


Figure 1: eMobility ecosystem (simplified)

As more EVs are introduced in the market, the relevant interactions will grow in complexity, with more complex use cases likely to emerge. However, in the short term, eMI3 will focus primarily on EV charging services, and work on setting the standards for operations that ensure interoperability between equipment, users, service providers and back-end systems. In this first specification, eMI3's focus is on introducing standardized unique identifiers, data models, attribute lists and data structures, including those that enable interoperability of market places and clearing houses.

A fundamental ingredient of the work of eMI3 is use cases[2]. As the deployment and uptake of EVs in the market increases, interactions between market actors and customers are likely to grow in complexity. This is likely therefore to give rise to increasingly more complex use cases.

Building from the existing set of use cases (see use case section, in point 2) a variety of roles[3] were identified.

An overview of the different actors, roles and objects is depicted in Figure 2. The green rectangular boxes within this figure represent the current scope of these actors, roles and objects. The core domains of e-Mobility are represented by three objects, namely charging infrastructure (EVSE), electric vehicles (EV) and the electric vehicle driver (EV Driver)[4]. Each of these objects is aggregated by a corresponding provider or operator. The electric vehicle original equipment manufacturer (EV OEM) manages vehicles, the EVSE operator manages the charging infrastructure and the electric vehicle service provider (EVSP)

[2] A list of steps, typically defining interactions between a role assumed by a given actor and a system, in order to achieve a goal.
[3] A role could be an actor, object or a system who are actively involved in a use case.
[4] For simplification a distinction between User, owner and corresponding systems was not made.

manages the services of the End Customers. All those actors assume corresponding roles with corresponding IT systems and services.

In a second level, e-Mobility Service Provider is depicted as a main actor. Based on the existing use cases, within eMI3 the main following roles are differentiated: Search & Find Provider, Smart Charging Provider[5] and (E-)Mobility Clearing House.

Beyond, in a third level, various services of different adjacent domains are relevant within the e-Mobility landscape and interact with the actors and roles defined above. This is the case of the service providers within the domain of cities, mobility infrastructure, vehicles and energy.

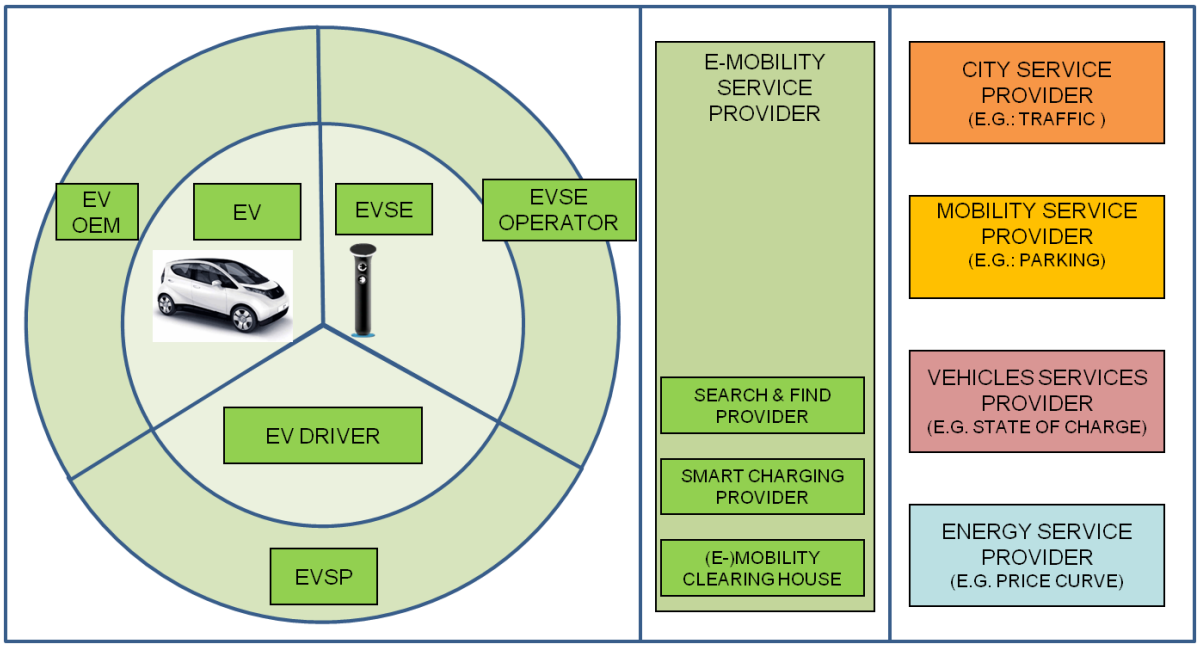


Figure 2: Overview Scope & Actors of EMI3

The roles and a description are listed in the following table:

Short Name	Description
EV Driver	A person using the EV and interacting with the EVSE to charge his vehicle.
EV	The Vehicle is used and charged. It contains a Battery with a certain level of charge, a Battery Management System to control the charge and mostly one channel to interact with the EV Driver.
EVSE	The electric vehicle supply equipment is used to charge the vehicle. It is operated by one EVSE operator.
EVSE Operator	The EVSE operator manages the EVSE.

[5] Smart charging can be provided as part of e-mobility service provider or other services providers as well as part of the “facility” services providers for private or semi-private infrastructure

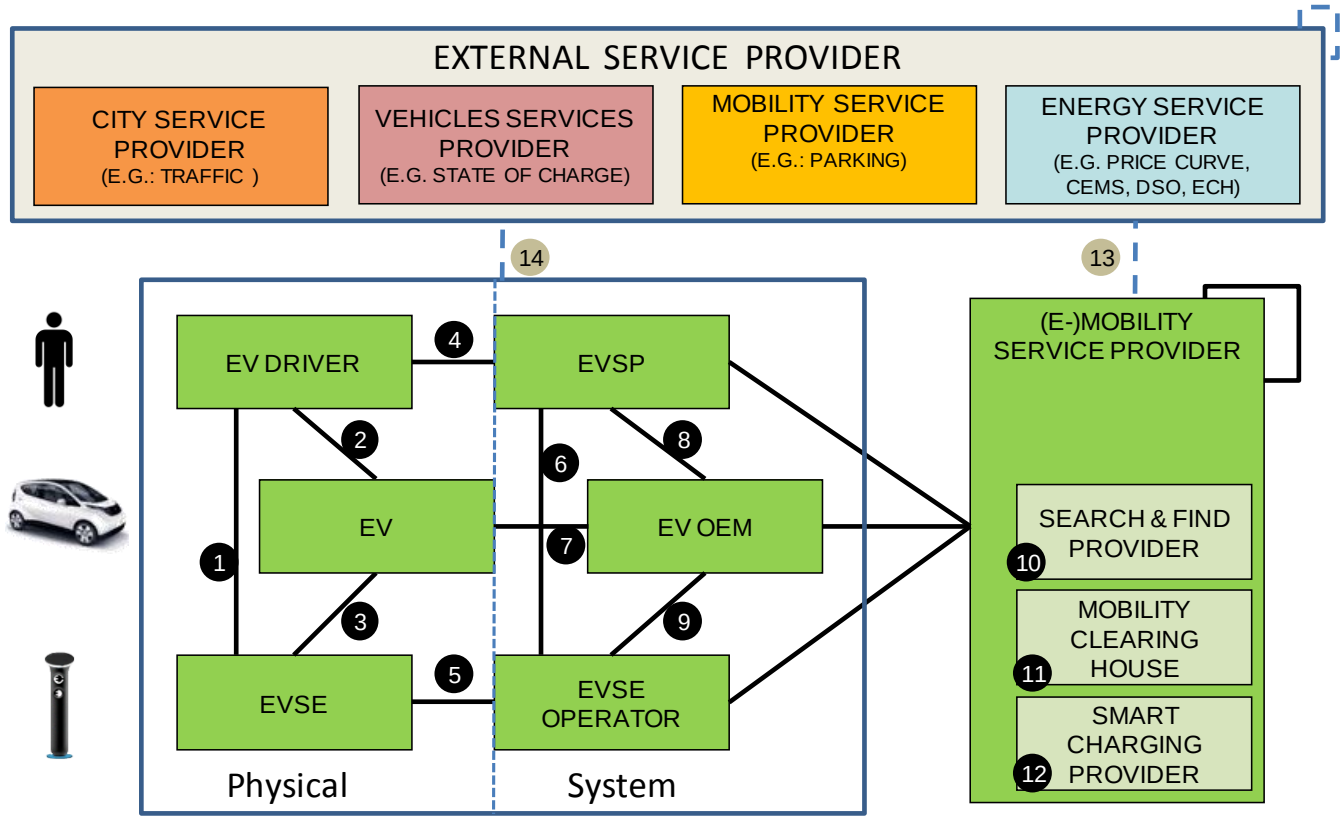
EVSP	The EV Service Provider offers eMobility services to the end customers (may include charging, search & find, routing and other services)
EV OEM	Manufacturers of electric vehicle
Search & Find Provider	Collects EVSE information and provides aggregated information of EVSEs
Smart Charging Provider	Calculates the smart charge plan based on energy, vehicle and user requirements
(E-)Mobility Clearing House	Facilitates the interaction between multitude of players by aggregating the communication and supporting authorisation and billing processes

Table 1: Roles and description

The different roles described in Table 1 do not necessarily correspond to different stakeholders. In other words, a given market actor can assume multiple roles (e.g.: association between EVSP and EVSE operator and “home electric mobility provider” and / or operator of other services, such as parking and search & find) and a specific role can be assumed by different players (e.g.: EVSPs).

An overview of the roles and interfaces considered for the purposes of this document is presented in Figure 3. This figure seeks to articulate where different roles end and others begin and clarifies what the interfaces – represented by numbers – are between each role’s IT systems, in order to establish what is exchanged between these roles and how. The different roles in use do not necessarily correspond to different stakeholders. In other words, a given enterprise can assume multiple roles (e.g.: association between EVSP and EVSE Operator and “home electric mobility provider” and / or operator of other services, such as parking and search & find) and a specific role can be assumed by different companies (e.g.: EVSPs).

A more detailed description of roles is presented in Chapter 2 which introduces a series of Use Cases.



Dashed lines: going out of EMI3 scope
Solid lines: within scope of EMI3

Diagram covers possible Interfaces. Contents of interfaces are interrelated and strongly depend on the chosen architecture.

Figure 3: Overview of main roles and interfaces in focus

The primary interfaces considered for the purpose of this role model include:

No.	Between		Description
1	EVSE	EV Driver	User authentication on EVSE (e.g.: EVSE tag / QR code).
2	EV	EV Driver	Communication mainly via user interface between EV and EV Driver could be also a third party interacting with the EV Driver
3	EV	EVSE	Communication between the electric vehicle and the charging infrastructure (ISO/IEC 15118 and IEC 61851).
4	EVSP	EV Driver	Contract + communication between service provider and the EV Driver.
5	EVSE	EVSE Operator	Communication between the charging infrastructure and the operator's system.
6	EVSP	EVSE Operator	Direct communication between the charging infrastructure operator and service provider.
7	EV	EV OEM	Data communication between EV and OEM Back End IT-System.
8	EVSP	EV OEM	Communication between an OEM Back End System and an EVSP Back End
9	EVSE Operator	EV OEM	Communication between EVSE Operator Back End System and EV Back End
10	EVSP, EV OEM, EVSE Operator	Search & Find Provider	Interface of the S&F Provider. Must consider the different requirements of the different communication partners e.g. EVSP and EVSE Operator.

No.	Between		Description
11	EVSP, EV OEM, EVSE Operator	(E-)Mobility Clearing House	Interface of the (E-)Mobility Clearing House (MCH). Must consider the different requirements of the different communication partners e.g. EVSP and EVSE Operator.
12	EVSP, EV OEM, EVSE Operator	Smart Charging Provider	Interface of the Smart Charging Service Provider. Must consider the different requirements of the different communication partners e.g. EVSP and EVSE Operator.
13	(E-)Mobility Service Provider	External Service Provider	Interface between the different (E-)Mobility Service Providers and External Service Providers of the domains City, Vehicle, Infrastructure and Energy.
14	(E-)Mobility IT-Systems	External Service Provider	Interface between the different eMobility IT-Systems such as EVSP, EV-OEM and EVSE Operator and External Service Providers of the domains City, Vehicle, Infrastructure and Energy.

Table 2: List of communication flows

This role model sets the baseline for the creation of use cases. Based on the short term objectives for eMI3, the focus was to set the adequate range of generic use cases that enable the consolidation of unique identifiers.

Table 3 systematizes how the different roles and interfaces, as defined in the global architecture, are referenced within the scope of the document.

Use Case	Interface													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
UC 100 – Search & Find		X		X	X	X			X					
UC 200 – Public Charging					X					X				
UE AA - Authentication & Authorization for basic charging with contract	X	X	X		X	X				X				
UE CS – Charging session management											X			
UE MD - Manage EVSE Directory		X		X	X	X			X					
UE U – Update EVSE status				X	X	X								X

Table 3: Roles and communication flow reference to use cases

Within its ongoing work, eMI3 endeavours to establish relevant touch points with converging standardization efforts, as is the case of ISO/IEC 15118 – Vehicle to Grid Communication Interface. These include, especially, reference to generic use cases set within ISO15118 and exchange of information on interfaces and protocols.

2 Use Cases

With regards to Use Cases, this standard features two types of standardized output: Use Cases (UC) and Use Case Elements (UCE). The Use Case Elements have been inspired by the ISO/IEC 15118-1 standard, however eMI3 decided not to follow the strictly hierarchical structure but to strive for most generic use cases applying use case elements which are or could be used in several use cases.

Use Case Elements have the format of use cases and could be regarded as a generic sub sequence within a use case. The use of Use Case Elements ensures a more pleasant reading and avoids redundancy.

eMI3 Use Cases and Use Case Elements SHALL be described using a common template based on IEC 62559 to describe the process steps and interactions of the involved actors for EV charging and related services.

The diagram in figure 4 below provides an overview of the current scope and the structure for the Use Cases and Use Case Elements which is applied in the following chapters.

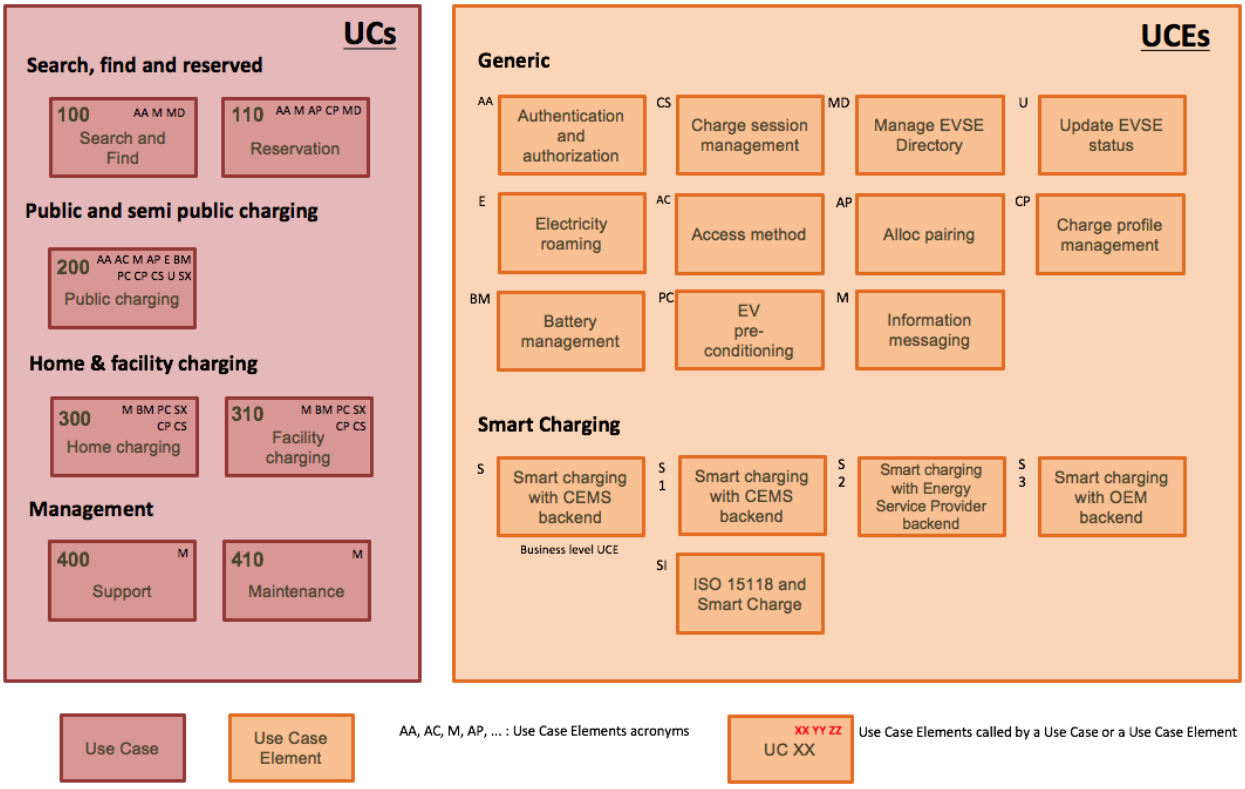


Figure 4: Overview of use cases and use case elements[6]

So far, eMI3 has successfully produced eight different Use Cases and Use Case Elements:

[6] eMI3 continuously seeks and responds to feedback from users of our output and therefore this document and its contents may evolve in order to accommodate new requirements

- UC 100: Search and Find
- UC 200: Public Charging
- UCE AA: Authentication and Authorization
- UCE E: Electricity Roaming
- UCE CS: Charge Session Management
- UCE U: Updating EVSE Status
- UCE MD: Manage EVSE Directory
- UCE SC: Smart Charging

Further descriptions are provided below.

2.1 Use Cases

This section provides a list of the use cases within the current eMI3 program of work. New use cases will be added in the next releases of the standard.

The use cases are available in the Annexes.

2.1.1 Search, Find and Reserve an EVSE

The Search, Find and Reserve category features all use cases aiming at enabling EV Drivers to search for and find charging stations and to make, delete or update a reservation.

2.1.1.1 Search and Find an EVSE (UC 100)

Search and find is a use case, which provides all of the specifications needed to both search for and find a charging spot. It includes the search in roaming situations, meaning that it also covers the cases where users attempt to charge outside in EVSE operated by an EVSE Operator or EVSO they do not have a direct contract with.

This Use Case features three different Use Case Elements: AA, M and MD, which are specified in the Figure 4.

The full UC is available in Annex – Use Cases (see p. 25).

2.1.2 Public and semi-public charging

Public and semi-public charging is the category covering the charging events in the charging infrastructure that is publicly accessible. It includes basic charging and smart charging and both of them include roaming features. Semi-public charging refers to using charging spots with restricted access.

One Use case has been covered in this category in the current version of the eMI3 standard.

2.1.2.1 Public charging (UC 200)

A public charging can occur with a public or a semi-public charging spot. The Use Case described within eMI3 includes both non-roaming and roaming situations. The charge has none of the attribute of a Smart Charge.

This Use Case features seven different Use Case Elements: AA, AC, M, AP, U, CS and E, which are specified in the Figure 4.

The full UC is available in the Annex – Use Cases (see p.29).

2.1.3 Home charging

Charging at home and semi-public at a company is estimated to cover roughly 80% of all charging events. It includes basic charge and smart charge. Semi-public charges are the charges occurring on charging spots with restricted access.

2.1.4 Management

The Management category presented in Figure 4 covers the main events occurring for the good management of the infrastructure. It includes Use Cases such as Support or Maintenance.

Use cases specified in this category will be provided in the next versions of the standard.

2.2 Use case elements

This section provides a list of the Use Cases Elements within the current eMI3 program of work. New Use Cases Elements will be added in the next releases of the standard.

The use case elements are presented are available in the Annexes.

2.2.1 Generic

The Generic category features all type of Use Case Elements providing different type of functions to the infrastructure. Five Use Case Elements have been specified for this category in the Figure 4 and one has already been covered in the V1.0 of the standard.

2.2.1.1 Authentication & Authorization (AA)

The Authentication and Authorization Use Case Element features is needed, by support all Use Cases where it is necessary that the EV Driver to authenticate himself and the authorization to use a e-Mobility service like “Public charging” at a specific charging spots.

This Use Case Element is used in two different Use Cases: Basic Charge and UC 210 (see Figure 4).Smart Charge.

The full UCE is available in Annex – Use Cases (see p. 35).

2.2.1.2 Electricity Roaming (E)

This UCE describes the process steps for enabling electricity roaming between an EV user's preferred Energy Supplier and an EVSE Operator where a charging occurs. The EVSP has a direct contract with the EV user. Within this contract, a preferred energy Supplier can be specified. An Energy Clearing House (ECH) is in charge of matching drivers' ID and their preferred energy supplier.

This Use Case Element is used by two different Use Cases: UC 200 and UC 310 (see Figure 4).

The full UCE is available in Annex – Use Cases (see p.22).

2.2.1.3 Charging session management (CS)

The intention of the charging session management is to inform the EV-Driver about the actual charging session. During the charging event the EV-Driver is supposed to get information about the already charged (consumed kWh) energy or the actual charging power (kW).

Furthermore the EV-Driver may have an intention to get all relevant time based charging session information like start of the charging session and also the duration of the charging session.

This Use Case Element is used by two different Use Cases: UC 200 and UC 210 (see Figure 4).

The full UCE is available in Annex – Use Cases (see p.43).

2.2.1.4 Manage EVSE Directory (MD)

The Use Case Element MD allows to exchange and manage the EVSE Directory in between EVSE Operators and EVSPs.

This Use Case Element is used by two different Use Cases: UC 100 and UC 110 (see Figure 4).

The full UCE is available in Annex – Use Cases (see p. 55).

2.2.1.5 Update EVSE status (U)

Update EVSE status is used from the EVSE-operator to inform the B2B actors (e.g. EVSP, Search & Find provider, Vehicles service provider) about the actual status of the EVSE.

The e-Mobility actor can use this information to inform the EV-Driver about the actual EVSE status, this can be done e.g. via a Smartphone App, customer portal, EV or other technologies. The Vehicles service provider can use this information to show the actual EVSE status within the EV to the EV-Driver.

Hereby it is important that the information is not linked to charging session (see UCE CS) which means the information can be used for “public” information (e.g. search for EVSEs).).

This Use Case Element is used by three different Use Cases: UC 200, UC 300 and UC 310 (see Figure 4).

The full UCE is available in Annex – Use Cases (see p.59).

2.2.2 Smart Charging

The Smart Charging category features all of the Use Case Elements describing the possible Smart Charging features. Four Use Case Elements have been specified in the Figure 4 in this category.

While working on these Use Case Elements, the members of eMI3 identified the possibility for a new role, to be defined in next version of this document: the Smart Charging Provider (SCP). See Annex – Use Cases for more information.

2.2.2.1 Smart Charging (S)

This use case element aims at providing the process steps of Smart Charging with a business level description.

More detailed use case elements will be available later with more comprehensive descriptions of exchanges of information at the system level.

This use case is organised into 6 steps:

- Get vehicle’s status and requirements
- Get user’s needs
- Get charging conditions at the consumer level and on the energy markets
- Get power grid conditions
- Charging procedure
- End of procedure

For better understanding, please refer to Smart Charging definition available in the eMI3 T&D.

This Use Case Element is used by two different Use Cases: UC 200 and UC 210 (see Figure 4).

The full UCE is available in Annex – Use Cases (see p.23).

Page left intentionally blank

3 Annexes

3.1 Use Cases

3.1.1 UC 100: Search & Find

ERTICO project title: eMI^3

Document title: UC Search & Find

Main author(s) or editor(s): Thomas Stiffel (Bosch)

Other author(s): Thomas Gereke (Gereke)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	30/03/2014	Thomas Stiffel	BOSCH	Initial draft adopted from previous discussions and pre-versions.
0.2	Draft	30/04/2014	Thomas Stiffel	BOSCH	Consolidation of different versions. & Clean Up Document. Integrate discussion from 7.4.
0.3	Draft	09/05/2014	Thomas Stiffel	BOSCH	Integrate changes discussed during review in UC call.
0.8	Draft	07/06/2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.9	Draft	22/07/2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.91	Draft	06/08/2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.92	Draft	08/10/2014	Thomas Stiffel	BOSCH	Changes to adopt generic Use Case Elements (UCE) and extension of Search Database Use Case.
0.93	Draft	19/11/2014	Thomas Stiffel, Thomas Gereke	BOSCH, Siemens	Integrate Changes discussed during review in UC Call 19.11.2014
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

Search	Find	EVSE	

<table>
<tr><td>Use Case ID</td><td colspan="5">UC 100</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Search and Find</td></tr>
<tr><td>UCE Included</td><td colspan="5">AA</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">The EV driver searches for an EVSE able to charge his EV suitable to his needs.
The ability to charge may be limited according for example to the contract of the EV Driver, the configuration of the EVSE and/or the EV or the EVSE accessibility.
Options/Extensions:
• The EV Driver uses the S&F service via an EVSP who interacts with the EV-driver. Alternatively the EV Driver uses the S&F service directly.
• EVSP may store EVSE data locally or request them online.
• The S&F Provider provides static data only or additional dynamic data of the charging station, such as status of the EVSE (e.g. “in use”, “maintenance”), available power (lower than rated power) or price of charging.
• The EV Driver may enter search criteria or the search criteria are prefilled by a profile/stored preferences and context information e.g. destination, current location, time and technical EV data like preferred charging port type (e.g. type 2, CCS) or charging power (e.g.22 kW)
• Status information (Dynamic Data) may be requested the same way (as search criteria and as a separate request) or they are transmitted within the initial search result.
• The EV-Driver can use the search multiple times in order to find a suitable charging station. E.G. search by different levels of aggregation.
• For dynamic data: the EVSE must have an online connection to the EVSE-Backend.
• The user may be required to authorize at the EVSE.</td></tr>
<tr><td>Actors</td><td colspan="5">EV Driver, EVSP, EVSE Operator, S&F Provider</td></tr>
<tr><td>Preconditions</td><td colspan="5">The S&F Provider has gathered and/or access to all relevant EVSE information (via a standard interface based on b2b agreements with EVSE Operator, see UCE MD).
The EV driver has a contract (free or paid) with an EVSP.
The EVSP has a contract with the S&F Provider to use its service.
(An EVSE-operator can act as a S&F provider, so a contract of usage EVSE data between EVSE-operator and EVSP is necessary).</td></tr>
<tr><td rowspan="4">Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1 O
UCE AA</td><td>EV authenticates with UCE AA[7]</td><td>EV driver</td><td>EVSP</td><td>eMA ID or any other mean to identify EV Driver</td></tr>
<tr><td>2 M</td><td>search criteria are set by EV Driver [8]</td><td>EV driver</td><td>EVSP</td><td>Search criteria from EV driver</td></tr>
<tr><td>3 M</td><td>search criteria are optionally checked and/or enriched and sent by EVSP</td><td>EVSP</td><td>S&F Provider</td><td>Search criteria from EVSP</td></tr>
</table>

[7] See Use Case Element description Authentication & Authorization

[8] See BO Search Criteria / Result

	4 M	S&F provider elaborates and sends search results	S&F Provider	EVSP	Pools/EVSEs answering request
	5 M	EVSP handles search result and sends data to EV Driver	EVSP	EV Driver	Pools/EVSEs answering request.
Extension	Description of alternatives or exceptions from the main steps				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
Post condition	The EV Driver receives the search result by the EVSP. The EV Driver knows an EVSE where he may charge his EV. The EV Driver may reserve an EVSE or a EVSE Pool[9]				
Security & Privacy Considerations	If the user profile is used any profile information must be highly secured.				
Remarks	The aspect of roaming (display only those EVSEs where the EV Driver is allowed to charge) can be treated either by the S&F Provider (e.g. defined as a search attribute) or by the EVSP influencing the list of charging stations which are transmitted or shown to the user. A third option may be to have third party e.g. a clearinghouse which has contractual constraints of the EV-Driver resp. of the EVSP to pre-select the available EVSE or EVSE operator. Search results may have different levels of details. E.g. it may be EVSE Pools only or specific EVSEs additionally.				

[9] See corresponding Use Case EVSE Reservation

3.1.2 UC 200: Public Charging

ERTICO project title: eMI^3

Document title: UC Public charging

Main author(s) or editor(s): Thomas Gereke (Siemens)

Other author(s): Ludovic Coutant (CNR)

Shantanu R Kothavale (ChargePoint)

Silvio Weeren (IBM()

Achim Friedland (Belectric Drive)

Paul Bertraud (EDF)

Gilles Bernard (Gireve)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	12/02/2014	Thomas Gereke	Siemens AG	Initial Version
0.2	Draft	26/02/2014	Thomas Gereke	Siemens AG	Input from telephone call GA Los Gatos
0.3	Draft	02/03/2014	Shantanu R Kothavale	ChargePoint	Added comments to PUCs Authentication & Authorization
0.4	Draft	11/03/2014	Thomas Gereke	Siemens AG	Added comments from telephone call 6.3.14
0.5	Draft	20/03/2014	Thomas Gereke	Siemens AG	Added comments from telephone call 20.3.14
0.6	Draft	07/04/2014	Thomas Gereke	Siemens AG	Added comments from telephone call 26.03.14
0.61	Draft	24/04/2014	Thomas Gereke	Siemens AG	Add comments from telephone call 24.04.14
0.7	Draft	02/07/2014	Thomas Gereke	Siemens AG	Add comments from telephone call 30.06.14
0.71	Draft	03/07/2014	Thomas Gereke	Siemens AG	Add comments from telephone call 2.7.14
0.8	Draft	23/07/2014	Thomas Gereke	Siemens AG	Add comments from telephone call 21.7.14
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

Public	Charging	EVSE	

<table>
<tr><td>Use Case Name</td><td colspan="5">UC 200</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Public Charging</td></tr>
<tr><td>UCE Included</td><td colspan="5">AA, U and CS</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">The primary goal of this UC is to acquire a sufficient EV battery state of charge at a public or semipublic charging station. Roaming is covered via an MCH when EVSP is unknown to the EVSE Operator Backend backend.
The first step is to physically connect the EV to the EVSE. Some cases however, the authentication and authorization have to be done before e.g. when the outlet is locked.
The EVSP customer account is identified and validated based on the eMA ID, charging options (e.g. AC, AC fast, DC) are negotiated and agreed and charging starts. If not, the charging is not started or interrupted.
The actual status (UCE U) of the EVSE (e.g. free, charging, reserved) may be communicated to the EVSE Operator backend and optionally further to EVSP e.g. for the service “Search for EVSE”.
The charging session status (UCE CS) may be forwarded to the EVSP to be made available to the EV driver.
When the charging session has ended, the EVSE Operator backend send the SDR to the relevant EVSP. In a roaming case, that means the authorization process was done by a transaction via a MCH (MCH). The SDR will be forwarded via the MCH.</td></tr>
<tr><td>Actors</td><td colspan="5">EV Driver, EVSP Customer, EVSP, EVSE Operator, EV, MCH</td></tr>
<tr><td>Preconditions</td><td colspan="5">EVSE can be identified with an EVSE-ID
EVSP Customer account can be identified with an eMA ID
EVSP can be identified with a EVSP-ID
EVSE Operator can be identified with a EVSE Operator-ID
EVSP Customer has an account with the EVSP
EV Driver has a valid eMA ID or token ID
Parking space at EVSE is available to EV</td></tr>
<tr><td>Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td></td><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td></td><td>1 M</td><td>EV connected to EVSE*</td><td>EV</td><td>EVSE</td><td>EV physically connected</td></tr>
<tr><td></td><td>2 M UCEAA</td><td>EV authenticates with UCE AA[10]</td><td>EV Driver / EV</td><td>EVSE</td><td>Valid of eMA ID, (authorized services, user preferences) EVSP Customer</td></tr>
<tr><td></td><td>3 O</td><td>Show available e-Mobility product (e.g. AC, AC-Fast, DC, inductive, etc.)</td><td>EVSE</td><td>EV Driver/EV</td><td>- Service content
- Conditions
- Timeframe
- Others</td></tr>
</table>

[10] See Use Case Element description Authentication & Authorization

	4 O	Select an e-Mobility product	EV Driver/EV	EVSE	e-Mobility product Req. kWh Charging timeframe Others (See also Chargeplan)
	5 O	Confirm service delivery (e.g. start of charging session)	EVSE	EV Driver/EV	Confirm Availability to start charging session (e-Mobility product ID)
	6 M	Start Charging Session	EVSE	EV Driver/EV	Charging session started
	7 O UCEU	Update EVSE Status with UCE U			
	8 O UCECS	Manage Charging Station with UCE CS			
	9.1 M UCEAA	End Charging Session with UCE AA	EV Driver / EV	EVSE	EVSE has validated this request
	10.1 M	Disconnect cable from EV and/or EVSE	EV	EVSE	EV physically disconnected
	11 M	End Charging Session	EVSE	EVSE Operator	Charging session ended
	12 O	Confirm Charging session details	EVSE	EV Driver	See ISO-15118
	13 O UCE U	Manage Charging Station with UCE CS			
	14 O UCE CS	Update EVSE Status with UCE U			
	15.1 M	Send SDR /CDR to MCH	EVSE Operator	MCH	Timestamp, EVSE-ID, EMA ID, service product ID, EVSE-operator session ID, kWh, Charging-time (one entry or table possible)
	16.1 M	Send SDR /CDR to EVSP	MCH	EVSP	Timestamp, EVSE-ID, EMA ID, service product ID, EVSE-operator session-ID, kWh, Charging-time (one entry or table possible)

<table>
<tr><td rowspan="4">Extension</td><td colspan="5">Step 9 and 10 occur in alternative order</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>9.2 M</td><td>Disconnect cable from EV and/or EVSE*</td><td>EV</td><td>EVSE</td><td>EV physically disconnected</td></tr>
<tr><td>10.2 M
UCEAA</td><td>End Charging Session with UCE AA</td><td>EV Driver / EV</td><td>EVSE</td><td>EVSE has validated this request</td></tr>
<tr><td rowspan="4">Extension</td><td colspan="5">EVSE Operator and EVSP communicate on a direct communication</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>15.2 M</td><td>Send SDR /CDR to EVSP</td><td>EVSE Operator</td><td>EVSP</td><td>Timestamp, EVSE-ID, EMA ID, service product ID, EVSE-operator session-ID, kWh, Charging-time (only one entry or table possible)</td></tr>
<tr><td>16.2 M</td><td>15.1 is skipped</td><td></td><td></td><td></td></tr>
<tr><td>Post condition</td><td colspan="5"></td></tr>
<tr><td>Security & Privacy Considerations</td><td colspan="5"></td></tr>
<tr><td>Remarks</td><td colspan="5">This UC will not cover the commercial contract handling between the EVSP and EVSE Operator backend or possible transaction fees from a involved clearing house.

*Sequence of Process step 1 and 2 could be reversed in case Authentication and Authorization is needed before you can connect to the EVSE.

Parking is not covered in this UC</td></tr>
</table>

Page left intentionally blank

3.2 Use Case Elements

3.2.1 UCE AA: Authentication & Authorisation

ERTICO project title: eMI^3

Document title: UCE Authentication & Authorization

Main author(s) or editor(s): Thomas Gereke (Siemens AG)

Other author(s): Ludovic Coutant (ITEMS International)

Shantanu R Kothavale (ChargePoint, Inc)

Silvio Weeren (IBM)

Achim Friedland (BELECTRIC Drive)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	05/02/2014	Thomas Gereke	Siemens AG	Initial Version
0.2	Draft	06/02/2014	Thomas Gereke	Siemens AG	Update webmeeting WG UC 5.2.2014
0.3	Draft	12/02/2014	Shantanu R K	ChargePoint, Inc	Added comments to PUCs Authentication & Authorization
0.4	Draft	26/02/2014	Thomas Gereke	Siemens AG	Update Review Los Gatos
0.5	Draft	11/03/2014	Thomas Gereke	Siemens AG	Update Telephone call 6.3.2014
0.6	Draft	20/03/2014	Thomas Gereke	Siemens AG	Update Telephone call 19.3.2014
0.7	Draft	07/04/2014	Thomas Gereke	Siemens AG	Update Telephone call 26.3.2014 Change in A&A for basic charging
0.8	Draft	24/04/2014	Thomas Gereke	Siemens AG	Update Telephone call 23.04.2014
0.9	Draft	01/07/2014	Thomas Gereke	Siemens AG	Update Telephone call 30.06.2014 (Definition and Abbreviations)
0.92	Draft	23/07/2014	Thomas Gereke	Siemens AG	Update Telephone call 30.06.2014 (Generic UCE AA including Access-types)

0.93	Draft	24/09/2014	Thomas Gereke	Siemens AG	Update comments from Achim Friedland
0.94	Draft	19/12/2014	Thomas Gereke	Siemens AG	Review consistency of calls to UCE and review consistency of editing and fill in missing parts in the introductive part
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

Authentication	EV	EMA	Basic
Authorization	EVSE	ID	Driver
Identification	station	EVSP	MCH
Public	Operator	Operator	Session
Charging	Backend		

<table>
<tr><td>Use Case ID</td><td>UCE AA</td></tr>
<tr><td>Use Case Name</td><td>Authentication & Authorization</td></tr>
<tr><td>Related UC</td><td>UC 100, UC 200</td></tr>
<tr><td>Goal & Narrative</td><td>Authentication is used to identify the relevant EVSP account (eMA ID) and followed by Authorization of this account for the required e mobility product e.g. basic charging.

The usage of authentication means (e.g. RFID/NFC/PLC/wireless/smartphone). E.g. a token-ID (e.g. Unique-ID of a RFID card) may be used for authentication.

The eMA ID identity includes only the “account-ID” but no details about the account / contract holder.

The authentication can be done via the following methods:
• Direct request of e-mobility product (e.g. charging) on EVSE
• Remote request of e-mobility product (e.g. charging) via EVSP
• 3rd party request of e-mobility product (e.g. charging) via EVSP
Furthermore the authentication can be done via a white or blacklist, stored on the EVSE or EVSE-backend, method.

The authentication request can be send with the tokens defined in part2.

It includes:
• EMA-ID
• User name (e.g. email) + PIN

<u>Authorization:</u>
The input data for the authorization are the EVSP customer data from the Authentication process and the requested or possible e mobility service product ID. Optional information about time and quantity could be send.

The Authorization request will be answered with a “yes” or “no”. Furthermore optional suggestion (variable parameters) could be provided.</td></tr>
<tr><td>Actors</td><td>EV Driver, EVSP, EVSE Operator, MCH (Mobility-Clearinghouse)</td></tr>
<tr><td>Preconditions</td><td>EVSE can be identified with a EVSE ID
EVSP Customer account can be identified with an eMA ID
EVSP can be identified with a EVSP ID
EVSE Operator can be identified with a EVSE Operator ID
EV Driver customer has a e-Mobility account with a EVSP
B2B contract between EVSP / EVSE Operator (and/or optional MCH)</td></tr>
<tr><td>Main steps</td><td>Description of the normal sequence of events
<table>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.1 M</td><td>Authentication on EVSE</td><td>EV-Driver / EV</td><td>EVSE</td><td>Identification e.g. eMA ID or token ID, e mobility product</td></tr>
<tr><td>2.1 M</td><td>Check A&A within EVSE</td><td>EVSE</td><td>EV / EV-Driver</td><td>A&A is valid, Charging session started</td></tr>
</table></td></tr>
</table>

	3 M	Confirm and start charging	EVSE	EV / EV-Driver	A&A is valid, Service can be used when denied no use of service (e.g. charging) is possible, e mobility product
Extension	Service request from EVSP (e.g. Smart Phone App)				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	1.2.1 M	Authentication & Authorization with EVSP and request for service (e.g. Basic charging)	EV Driver	EVSP	Authorization and Service Request with eMA ID, EVSE ID
	1.2.2.1 M	Send service request to MCH	EVSP	MCH	Authorization and service request with eMA ID, EVSE ID, EVSP Session ID, e mobility product
	1.2.3.1 M	Send service request to EVSE Operator Backend	MCH	EVSE Operator	Authorization and service request with eMA ID, EVSE ID, EVSP Session ID, MCH Session ID, e mobility product
	1.2.4 M	Remote service request to EVSE	EVSE Operator	EVSE	Charging Request, eMA ID, EVSE ID, e mobility product
	2.2.1 O	Confirm service request (e.g. charging session can start)	EVSE	EVSE Operator	EVSE ID, eMA ID, Status, timestamp, e mobility product
	2.2.2.1 O	Confirm service request to MCH	EVSE Operator	MCH	EVSE ID, eMA ID, Status, timestamp, EVSE Operator Backend Session IID, MCH Session IID, e mobility product
	2.2.3.1 O	Confirm service request to EVSP	MCH	EVSP	EVSE ID, eMA ID, Status, timestamp, EVSE Operator Backend Session IID, MCH Session IID, EVSP Session IID, e mobility product
	2.2.4 O	Confirm service request to EV-Customer	EVSP	EV-Customer	EVSE ID, eMA ID, Status, timestamp

Extension	A&A request is sent to EVSE Operator				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.3.1 M	Send A&A Request to EVSE Operator	EVSE	EVSE Operator	Identification (eMA ID) or token ID, EVSE ID, e mobility product
	2.3.2 M	Confirm A&A request to EVSE	EVSE Operator	EVSE	Confirm A&A request (optional Session ID)
	2.3.3 M	Confirm A&A request to EV-Driver	EVSE	EV / EV-Driver	A&A is valid, Charging session started
Extension	A&A request is sent to MCH				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.4. 1 M	Send A&A Request to Mobility clearinghouse	EVSE Operator	MCH	Identification (eMA ID) or token ID, EVSE ID, EVSE-Operator Session ID, EVSE Operator Backend, e mobility product
	2.4. 2 M	MCH answer A&A Request to EVSE Operator	MCH	EVSE Operator	A&A is valid, Service can be used
	2.4. 3 M	Send A&A confirmation to EVSE	EVSE Operator	EVSE	Identification (eMA ID) or token ID, EVSE ID, EVSE-Operator Session ID, e mobility product
	2.4. 4 M	Confirm A&A request to EV-Driver	EVSE	EV / EV-Driver	A&A is valid, Charging session started
Extension	A&A request is sent to EVSP				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.5. 1.1 M	Check A&A request within EVSP and confirm or deny to Mobility clearinghouse	EVSE Operator	MCH	A&A is valid or denied, e mobility product
	2.5. 2.1 M	Forward EVSP A&A result to EVSE Operator Backend	MCH	EVSP	A&A is valid or denied, e mobility product
	2.5. 3.1 M	Check A&A request within EVSP Backend and confirm or deny to EVSE backend	EVSP	MCH	Identification (eMA ID) or token ID, EVSE ID, EVSE-Operator Session ID, EVSP Session ID, e mobility product
	2.5. 4.1 M	Check A&A request within EVSP Backend and confirm or deny to EVSE backend	MCH	EVSE Operator	Identification (eMA ID) or token ID, EVSE ID,

					EVSE-Operator Session ID, EVSP Session ID, e mobility product
	2.5.5 M	Send A&A confirmation to EVSE	EVSE Operator	EVSE	Identification (eMA ID) or token ID, EVSE ID, EVSE-Operator Session ID, e mobility product
	2.5.6 M	Confirm A&A request to EV-Driver	EVSE	EV / EV-Driver	A&A is valid, Charging session started
Extension	EVSE operator and EVSP communicate with direct communication				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	1.2.2.2 M	Send service request to MCH	EVSP	EVSE Operator	Authorization and service request with eMA ID, EVSE ID, EVSP Session ID, e mobility product
	1.2.3.2 M	Step 1.2.3.1 is skipped			
	2.2.2.2 O	Confirm service request to MCH	EVSE Operator	EVSP	EVSE ID, eMA ID, Status, timestamp, EVSE Operator Backend Session IID, MCH Session IID, e mobility product
	2.2.3.2 O	Step 2.2.3.1 is skipped			
	2.5.1.2 M	Check A&A request within EVSP and confirm or deny to Mobility clearinghouse	EVSE Operator	EVSP	A&A is valid or denied, e mobility product
	2.5.2.2 M	Step 2.4.2.1 is skipped			
	2.5.3.2 M	Check A&A request within EVSP Backend and confirm or deny to EVSE backend	EVSP	EVSE Operator	Identification (eMA ID) or token ID, EVSE ID, EVSE-Operator Session ID, EVSP Session ID, e mobility product
	2.5.4.2 M	Step 2.5.4.1 is skipped			
Post condition					
Security & Privacy Considerations	To provide secure authentication in the RFID/NFC/PLC/wireless cases, the EVSE shall use a challenge-response protocol. The challenge data and the response data are sent to the Authenticator (home EVSP or MCH), which can then verify the identity of the credential.				

Remarks	If the user profile and data are used this data must be highly secured. Possible Access-types on EVSP = see UCE_AA White list sub-process and eMA ID handling with ISO 15118 (exchange eMA ID between EVSP and EVSE Operator / EV) not scope of this PUC *Sequence of Process step 1 could in some case different, that means you have first the Authentication and Authorization before you can connect to the EVSE

Page left intentionally blank

ERTICO project title: **eMI^3**

Document title: **UCE E Electricity Roaming V1.0**

Electronic reference: eMI3-standard-v1.1-Part 1.docx

Main author(s) or editor(s): Ludovic Coutant (CNR / Items International)

Other author(s): Arnaud Cuisson (CNR)

Thomas Gereke (Siemens)

Luis Reis (CEIIA)

Ton Karelse (Allego)

Jan Wieling (Allego)

Document history:

Version	Status	Date	Main author (Organisation)	Summary of changes
0.1	Draft	02/07/2014	Ludovic Coutant (CNR / Items International)	First draft
0.2	Draft	07/07/2014	Ludovic Coutant (CNR / Items International)	Improved draft with integration of comments for WG UC web meeting of 07/07/14
0.3	Final	22/07/2014	Ludovic Coutant (CNR / Items International)	Improved version with comments for WG UC web meeting of 11/07/14 and Thomas Gereke
0.4	Final	30/10/2014	Luis Reis (CEIIA)	Improved version with input from Luis Reis and his experience of electricity roaming at Mobi.e
0.5	Final	4/11/2014	Ludovic Coutant (CNR / Items International)	Improved version with a extension enabling EVSP to communicate with the local grid operator and improved diagram
0,6	Final	7/11/2014	Ludovic Coutant (CNR / Items International)	Improved version with comments from Thomas Gereke. The initialisation phase now also checks if roaming is needed or not.
0,7	Final	14/11/2016	Ton Karelse (Allego)	Comment replies and minor improvements of the documents.
0,8	Final	21/09/2017	Ludovic Coutant (CNR), Jan Wieling (Allego)	Cleaning of the current version and addition of a remark on ad-hoc energy supplier.
0,9	Final	5/10/2017	Jan Wieling (Allego)	Revision of the use case with the introduction of a ECH.
1.0	Final	01/06/2018	Ludovic Coutant (CNR)	Final version including comments of eMI3 members and a final remark made during the GA in Brussels.

Keywords:

Electricity Roaming	Energy Supplier		

<table>
<tr><td>Use Case ID</td><td colspan="5">UCE E
Included in UC 200, UC 210, UC 300 and UC 310</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Electricity roaming</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">This UCE describes the process steps for enabling electricity roaming between an EV user’s preferred Energy Supplier and an EVSE Operator where a charging occurs. The EVSP has a direct contract with the EV user. Within this contract, a preferred energy Supplier can be specified. An Energy Clearing House (ECH) is in charge of matching drivers’ ID and their preferred energy supplier.
The UCE E is organised in three steps:
1) Initialisation
When an EV driver is charging on a charging station and has specified in their contract with their EVSP a preferred Energy Supplier, a request is sent by the EVSE Operator to the ECH in order to check if electricity roaming can be applied and, if so, to initiate it.
2) Updating
After electricity roaming has been activated, the EVSE Operator can periodically send to the ECH the quantity of energy consumed by the EV (in kWh). The ECH can forward this information to the preferred Energy Supplier of the EV Driver and may forward this information to both the EVSE Operator Energy Supplier and the DSO. Based on this information interaction is possible between the EV driver’s preferred Energy Supplier and the EVSE Operator Energy Supplier.
3) End of procedure
At the end of the charging, the EVSE Operator issues an end notification, which includes the Session Info and a chronicle (load profile) of the charging, and sends it to the ECH. The ECH then forwards this information to the preferred Energy Supplier of the EV driver and may forward it to both the DSO and the EVSE Operator Energy Supplier.</td></tr>
<tr><td>Actors</td><td colspan="5">EVSE Operator, Mobility CH, Electricity CH, EVSP, Energy Supplier U (EV user preferred Energy Supplier), Energy Supplier O (EVSE Operator Energy Supplier), DSO</td></tr>
<tr><td>Preconditions</td><td colspan="5">Rules for electricity roaming, involving Suppliers and grid operators, have been defined.
EV driver has been successfully authenticated.
A session ID for the charging process has been issued.
The EV is plugged and the charging has just started.
During the initialisation of electricity roaming, the EV driver can decide to manually opt for energy supply on the spot, which will be used instead of the preferred energy Supplier’s supply.</td></tr>
<tr><td>Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td></td><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td></td><td colspan="5">Initiation of the electricity roaming procedure</td></tr>
<tr><td></td><td>1.1 M</td><td>EVSE Operator sends a request to the ECH with the Session ID in order to check if electricity roaming can be applied.</td><td>EVSE Operator</td><td>ECH</td><td>Session ID and electricity roaming initialization request</td></tr>
<tr><td></td><td>2.1M</td><td>ECH answers the electricity roaming request to the EVSE Operator with a validation and an update frequency.</td><td>ECH</td><td>EVSE Operator</td><td>Validation and update frequency</td></tr>
<tr><td></td><td>3.1 O</td><td>ECH transfers the electricity roaming request to Energy Supplier U.</td><td>ECH</td><td>Energy Supplier U</td><td>Electricity roaming initialisation request*</td></tr>
<tr><td></td><td>4.1 M</td><td>EVSE Operator sends the validation and the update frequency to MCH.</td><td>EVSE Operator</td><td>MCH</td><td>Validation and update frequency</td></tr>
</table>

	5.1 M	MCH transfers validation and an update frequency to EVSP.	MCH	EVSP	Validation and update frequency
	6 O	EVSE Operator sends the electricity roaming request to Energy Supplier O.	EVSE Operator	Energy Supplier O	Electricity roaming initialisation request*
	Update electricity roaming status *Steps 8 to 11 may be periodically repeated until the charging ends according to the update frequency mentioned at step 6*				
	7.1 M	Send Charging Session details with UCE CS	EVSE Operator	ECH	It is mandatory to exchange the following fields: Consumed Energy, Start Charge Session and Charge Session Duration
	8.1 M	ECH transfers the Consumed Energy, Start Charge Session and Charge Session Duration fields to Energy Supplier U.	ECH	Energy Supplier U	Consumed Energy, Start Charge Session and Charge Session Duration*
	9.1 M	EVSE Operator sends Consumed Energy, Start Charge Session and Charge Session Duration fields to MCH.	EVSE Operator	MCH	Consumed Energy, Start Charge Session and Charge Session Duration
	10.1 M	MCH transfers Consumed Energy, Start Charge Session and Charge Session Duration fields to EVSP.	MCH	EVSP	Consumed Energy, Start Charge Session and Charge Session Duration
	11 O	EVSE Operator sends Consumed Energy to Energy Supplier O.	EVSE Operator	Energy Supplier O	Consumed Energy
	12 O	EVSE Operator sends Consumed Energy, Start Charge Session and Charge Session Duration fields to DSO.	EVSE Operator	DSO	Consumed Energy, Start Charge Session and Charge Session Duration
	End electricity roaming procedure				
	13.1 M	EVSE Operator sends an end notification, the Session info and the chronicle (load profile) of the charging with the Session ID to ECH.	EVSE Operator	ECH	Session ID, end electricity roaming notification, Session info, and the chronicle
	14.1 M	ECH transfers the end notification, the Session info and the chronicle (load profile) of the charging to Energy Supplier U.	ECH	Energy Supplier U	Session ID, end electricity roaming notification, Session info and the chronicle*
	15.1 M	EVSE Operator sends an end notification, the Session info and chronicle (load profile) of the charging with the Session ID to MCH.	EVSE Operator	MCH	Session ID, end electricity roaming notification, Session info and the chronicle

	16.1 M	MCH transfers the end notification, the Session info and chronicle (load profile) of the charging with the Session ID to EVSP.	MCH	EVSP	Session ID, end electricity roaming notification, Session info and the chronicle
	17 O	EVSE Operator sends an end notification, the Session info and the chronicle (load profile) of the charging to Energy Supplier O.	EVSE Operator	Energy Supplier O	Session ID, end electricity roaming notification, Session info and the chronicle
	18 O	EVSE Operator transfers an end notification acknowledgment with session ID to DSO.	EVSE Operator	DSO	Session ID, end electricity roaming notification, Session info and the chronicle
Extension	The ECH does not know the preferred energy supplier of a user				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	1.2.1 M	EVSE Operator sends a request to the ECH with the Session ID in order to check if electricity roaming can be applied.	EVSE Operator	ECH	Session ID and electricity roaming initialization request
	1.2.2 M	ECH forwards the request to the MCH	ECH	MCH	Session ID and electricity roaming initialization request
	1.2.3 M	MCH forwards the request to the EVSP	MCH	EVSP	Session ID and electricity roaming initialization request
	1.2.4 M	EVSP replies to the MCH with a validation and an update frequency	EVSP	MCH	Validation and update frequency
	1.2.5	MCH replies to the ECH with a validation and an update frequency	MCH	ECH	Validation and update frequency
Extension	The ECH replies to the electricity roaming reply with a denial				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.2.1 M	Energy Supplier U answers EVSP with a denial of the electricity procedure.	ECH	EVSE Operator	Electricity roaming denial
	2.2.2 M	Procedure ends			
Extension	The EVSE Operator interacts in direct communication with Energy Supplier U and/or the EVSP				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	3.2 O	EVSE Operator sends an electricity roaming request to Energy Supplier U.	EVSE Operator	Energy Supplier U	Electricity roaming initialisation request*
	4.2 M	EVSE Operator sends validation and an update frequency to MCH.	EVSE Operator	EVSP	Validation and update frequency

	5.2 M	Step 6 does not occur cause no longer accurate			
	7.2 M	Send Charging Session details with UCE CS	EVSE Operator	Energy Supplier U	It is mandatory to exchange the following fields: Consumed Energy, Start Charge Session and Charge Session Duration
	8.2 M	Step 8 does not occur cause no longer accurate			
	9.2 M	EVSE Operator sends Consumed Energy, Start Charge Session and Charge Session Duration fields to MCH.	EVSE Operator	EVSP	Consumed Energy, Start Charge Session and Charge Session Duration
	10.2 M	Step 12 does not occur cause no longer accurate			
	13.2 M	EVSE Operator sends an end notification, the Session info and the chronicle (load profile) of the charging with the Session ID to ECH.	EVSE Operator	Energy Supplier U	Session ID, end electricity roaming notification, Session info, and the chronicle
	14.2 M	Step 14 does not occur because it is no longer accurate			
	15.2 M	EVSE Operator sends an end notification, the Session info and chronicle (load profile) of the charging with the Session ID to EVSP.	EVSE Operator	EVSP	Session ID, end electricity roaming notification, Session info and the chronicle
	16.2 M	Step 16 does not occur because it is no longer accurate			
Post condition	The charging ends.				
Security & Privacy Considerations					
Remarks	* some other information may optionally be included, such as forecast of kWh needed, timeframe of the charging, contract reference, … Updating period will be defined at a later stage but in this example it can be null, meaning that the procedure will not include any update, or vary from 1 to 120 minutes. Steps 3, 6 and 11 in between the EVSP and Energy Supplier U, are optional because they may be realised using a different protocol depending on potential bilateral agreements. The final report of the charging should include all of the intermediary updates sent through the procedure. Session ID may be complemented with an eMA ID. A specific implementation of electricity roaming has taken place in Portugal in the frame of the Mobi.e program[11].				

[11] http://emi3group.com/wp-content/uploads/sites/5/2018/06/Apresentacao-ME_ENG_2018.pdf

Description diagram:

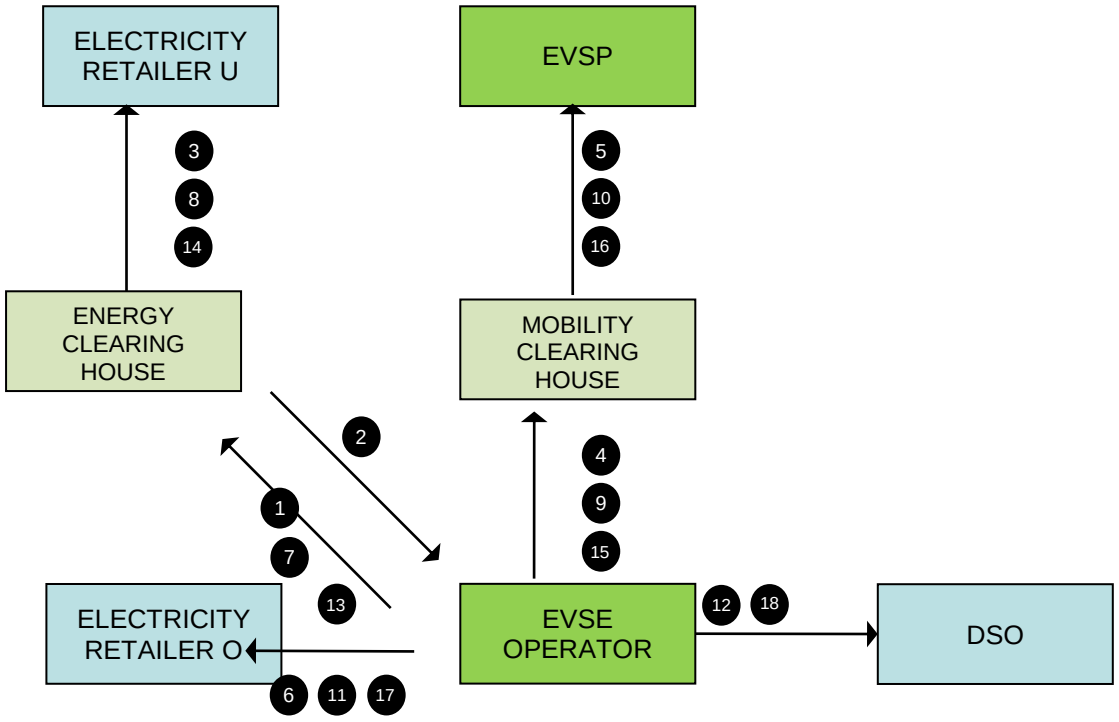


Figure 5: interactions diagram

Page left intentionally blank

3.2.2 UCE CS: Charging Station Management

ERTICO project title: eMI^3

Document title: UCE Charging Session Management

Main author(s) or editor(s): Thomas Gereke (Siemens AG)

Other author(s): Silvio Weeren (IBM)

Thomas Stiffel (Bosch)

Achim Friedland (BELECTRIC DRIVE)

Ludovic Coutant (ITEMS)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	30/07/2014	Thomas Gereke	Siemens AG	Initial Version
0.2	Draft	31/07/2014	Thomas Gereke	Siemens AG	Update from telephone-call 30.07.2014
0.3	Draft	24/09/2014	Thomas Gereke	Siemens AG	Update
0.4	Draft	02/10/2014	Thomas Gereke	Siemens AG	Update from telephone call 29.09.2014
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

EVSE	Charging	Session	

<table>
<tr><td>Use Case ID</td><td colspan="5">UCE CS</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Charging Session Management</td></tr>
<tr><td>Related UC</td><td colspan="5">UC 100, UC 200</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">The intention of the charging session management is to inform the EV-Driver about the actual charging session. During the charging event the EV-Driver is supposed to get information about the already charged (consumed kWh) energy or the actual charging power (kW). Furthermore the EV-Driver may have an intention to get all relevant time based charging session information like start of the charging session and also the duration of the charging session.

The information of the EV-Driver will always be transferred via the relevant EVSP. The EVSP can use different information channels to inform the EV Driver about the actual charging session, this can be done e.g. via a Smartphone App, customer portal or SMS from the EVSP. Hereby it is import that only the relevant EV-Driver / eMobility customer, derived from the eMA ID, will get this information.

For the “push mechanism” -> The timing (e.g. frequency) of information exchange actual charging session is determined by the EVSE-Operator.

For the “request (pull) mechanism” -> The timing (e.g. frequency) of information exchange actual charging session is determined by the EVSP.

The charging session data can only be sent from the EVSE-Operator when a charging session is started until the charging session is ended.</td></tr>
<tr><td>Actors</td><td colspan="5">EV Driver, e-Mobility customer, EVSP, EVSE Operator, MCH (Mobility-Clearinghouse)</td></tr>
<tr><td>Preconditions</td><td colspan="5">• EVSE can be identified with an EVSE ID
• EVSP Customer account can be identified with an eMA ID
• EVSP can be identified with an EVSP ID
• EVSE Operator can be identified with a EVSE Operator ID
• EV Driver customer has an eMobility account with an EVSP
• B2B contract between EVSP / EVSE Operator (and/or optional MCH)
• EVSE is connected to the EVSE operator backend (CMS)</td></tr>
<tr><td rowspan="6">Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.1 M</td><td>Send initial/update/end of Charging session data</td><td>EVSE</td><td>EVSE-operator</td><td>eMA-ID/Token-ID, EVSE ID, charging session status, Optional field</td></tr>
<tr><td>2.1 M</td><td>Request of actual charging session status</td><td>EVSE-operator</td><td>MCH</td><td>eMA-ID / Token-ID, EVSP Charging session ID, EVSE operator ID, Optional fields</td></tr>
<tr><td>3.1 M</td><td>Request of actual charging session status</td><td>MCH</td><td>EVSP</td><td>eMA-ID / Token-ID, EVSP Charging Session-ID, EVSE operator session ID, MCH session ID, Optional fields</td></tr>
<tr><td>4.1 M</td><td>Send initial/update/end of Charging session data</td><td>EVSP</td><td>EV-Driver, e Mobility customer</td><td>eMA-ID/Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session, Optional fields</td></tr>
</table>

Extension	**Pull mechanism:** to EVSE-operator from EVSP				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	1.2 M	Request of EV-Driver about actual charging session status	EV-Driver	EVSP	eMA-ID / Token-ID, EVSP Charging session ID
	2.2.1 M	Request of actual charging session status	EVSP	MCH	eMA-ID / Token-ID, EVSP Charging Session ID, EVSE operator ID
	3.2.1 M	MCH transfers the demand to EVSE Operator	MCH	EVSE operator	eMA-ID / Token-ID, EVSP Charging Session ID, EVSE operator ID
	4.2.1 M	Check actual status of charging session and send actual charging session data	EVSE operator	MCH	eMA-ID /Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session, Optional fields
	5.1 M	MCH transfers the information to EVSP	MCH	EVSP	eMA-ID /Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session, Optional fields
	6 M	Send initial/update/end of Charging session data	EVSP	EV-Driver, e Mobility customer	eMA-ID /Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session, Optional fields
Extension	EVSE operator and EVSP communicate with direct communication				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.3 M	Send initial/update/end of Charging session data	EVSE operator	EVSP	eMA-ID / Token-ID, EVSP Charging session ID, EVSE operator ID, Optional fields
	3.2 M	Step 3.1 is skipped			
	2.2.2 M	Check actual status of charging session and send actual charging session data (then step 4)	EVSP	EVSE operator	eMA-ID /Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session
	3.2.2 M	Step 3.2.1 is skipped			
	4.2.2	Check actual status of charging session and send actual charging session data	EVSE operator	EVSP	eMA-ID /Token-ID, EVSE ID, EVSE operator session-ID, Actual status charging session, Optional fields
	5.2	Step 5.1 is skipped			

Post condition	
Security & Privacy Considerations	Data privacy protection consideration of individual For operational data (operate and control) the data policy for MCH data and meta data logging and storage have to be considered
Remarks	* Update frequency is depending on the EVSE-operator (CMS)

3.2.3 UCE MD: Manage EVSE Directory

ERTICO project title: eMI^3

Document title: UCE Manage EVSE Directory

Main author(s) or editor(s): Thomas Stiffel (Bosch)

Other author(s): Thomas Gereke (Siemens)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	30/03/2014	Thomas Stiffel	BOSCH	Initial draft adopted from previous discussions and pre-versions.
0.2	Draft	30/04/2014	Thomas Stiffel	BOSCH	Consolidation of different versions. & Clean Up Document. Integrate discussion from 7.4.
0.3	Draft	09.05.2014	Thomas Stiffel	BOSCH	Integrate changes discussed during review in UC call.
0.8	Draft	07.06.2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.9	Draft	22.07.2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.91	Draft	06.08.2014	Thomas Stiffel	BOSCH	Integrate Changes discussed during review in UC Call & Check Terminology.
0.92	Draft	08.10.2014	Thomas Stiffel	BOSCH	Changes to adopt generic Use Case Elements (UCE) and extension of Search Database Use Case.
0.93	Draft	19.11.2014	Thomas Stiffel, Thomas Gereke	BOSCH, Siemens	Integrate Changes discussed during review in UC Call 19.11.2014
0.94	Draft	19.12.2014	Thomas Stiffel	BOSCH	Separated Use Search & Find and UCE MD into two documents
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

Manage	EVSE	Directory	

<table>
<tr><td>Use Case ID</td><td colspan="5">UCE MD</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Manage EVSE Directory</td></tr>
<tr><td>Related UC</td><td colspan="5">UC 100, UC 200</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">S&F providers collect static and/or dynamic data from EVSE Operators and other S&F providers.
S&F Provider may aggregate and structure the data according to different aspects.
Data may be transmitted online (Pull from EVSE-Operator) or provided by the EVSE operator (Push). The interfaces can be the same but can be different as well.
The request for information may be periodically or on request.
For performance reason the S&F provider may store or cache the collected information.
In order to reduce effort, one or a few S&F Providers may act as or maintain a central station directory (CSD).</td></tr>
<tr><td>Actors</td><td colspan="5">EVSP, EVSE Operator, S&F Provider</td></tr>
<tr><td>Preconditions</td><td colspan="5">Definition of contracted data between:
EVSE Operator and S&F Provider
Between S&F Providers if data is exchanged</td></tr>
<tr><td rowspan="5">Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.1 M</td><td>Request Data from EVSE operator[12]</td><td>S&F Provider</td><td>EVSE Operator</td><td>Data request
Optional: Search parameter</td></tr>
<tr><td>2.1 M</td><td>Sent EVSE data</td><td>EVSE Operator</td><td>S&F Provider</td><td>Contracted EVSE static data</td></tr>
<tr><td>3.1 O[13]</td><td>Manage Data (e.g. harmonize & aggregate) & Provide to S&F requestor.</td><td>S&F Provider</td><td>EVSP Operator</td><td>List of EVSE according to search request</td></tr>
<tr><td rowspan="4">Extension</td><td colspan="5">Pull mechanism</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.2.1 M</td><td>Request status data from EVSE operator</td><td>S&F Provider</td><td>EVSE Operator</td><td>Data request (single or list of EVSE)</td></tr>
<tr><td>2.2.1 M</td><td>Sent EVSE status data</td><td>EVSE Operator</td><td>S&F Provider</td><td>Contracted EVSE dynamic data</td></tr>
<tr><td rowspan="3">Extension</td><td colspan="5">Dynamic collection</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.2 O</td><td>EVSE operator provides data
After change of static data or periodically</td><td>EVSE Operator</td><td>S&F Provider</td><td>Contracted EVSE static data (Bulk Operation)</td></tr>
</table>

[12] Could be periodically or on request e.g. from the EVSP-Operator.

[13] Link to use case UC 100 Search & Find EVSE initiated by EV Driver.

	1.2.2 O	EVSE operator provides status information of all EVSE After status change or periodically	EVSE Operator	S&F Provider	Contracted EVSE static data
	2.2.2 O	EVSE Operator provides status information of selected charging stations (charging stations with status change)	EVSE Operator	S&F Provider	Contracted EVSE static data
Post condition	EVSE Information is available to be used by the relevant actors(EV Driver EVSP, S&F-P). EVSE information is aligned to the EMI3 description of EVSE [see Standard Part II).				
Security & Privacy Considerations	Continuous availability information should not be accessible by everyone.				
Remarks	Provision of information (static data) may be incremental or cover the full data load. The data provided may have a limited validity period. It must be possible to delete data resp. to withdraw provided data. It is not defined when and how the data is stored or provided.				

3.2.4 UC U: Update EVSE Status

ERTICO project title: eMI^3

Document title: UCE U Update EVSE status

Main author(s) or editor(s): Thomas Gereke (Siemens AG)

Other author(s): Silvio Weeren (IBM)

Thomas Stiffel (Bosch)

Ludovic Coutant (ITEMS International)

Achim Friedland (BELECTRIC Drive)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	30/07/2014	Thomas Gereke	Siemens AG	Initial Version
0.2	Draft	31/07/2014	Thomas Gereke	Siemens AG	Update from telephone call 30.07.2014
0.3	Draft	24/09/2014	Thomas Gereke	Siemens AG	Update
0.4	Draft	30/09/2014	Thomas Gereke	Siemens AG	Update from telephone call 29.09.2014
1.0	Final	16/02/2015	Ludovic Coutant	CNR	Final review for implementation in part 1 of Standard v1.0

Keywords:

EVSE	Status	Update	

<table>
<tr><td>Use Case ID</td><td colspan="5">UCE U</td></tr>
<tr><td>Use Case Name</td><td colspan="5">Update EVSE status</td></tr>
<tr><td>Related UC</td><td colspan="5">UC 100, UC 200</td></tr>
<tr><td>Goal & Narrative</td><td colspan="5">Update EVSE status is used from the EVSE-operator to inform the B2B actors (e.g. EVSP, Search & Find provider, Vehicles service provider) about the actual status of the EVSE.

The e-Mobility actor can use this information to inform the EV-Driver about the actual EVSE status, this can be done e.g. via a Smartphone App, customer portal, EV or other technologies. The Vehicles service provider can use this information to show the actual EVSE status within the EV to the EV-Driver.

Hereby it is import that the information is not linked to charging session (see UCE CS) which means the information can be used for “public” information (e.g. search for EVSEs)

For the “push mechanism” -> The timing (e.g. frequency) of information exchange actual charging session is determined by the EVSE-Operator.

For the “request (pull) mechanism” -> The timing (e.g. frequency) of information exchange actual charging session is determined by the EVSP.</td></tr>
<tr><td>Actors</td><td colspan="5">EVSP, EVSE Operator, MCH (Mobility-Clearinghouse), Search & Find Provider, Vehicle Service Provider</td></tr>
<tr><td>Preconditions</td><td colspan="5">• EVSE can be identified with an EVSE ID
• EVSP can be identified with a EVSP ID
• EVSE Operator can be identified with a EVSE Operator ID
• B2B contract between EVSP / EVSE Operator (and/or optional MCH)
• EVSE is connected to EVSE operator backend (CMS)</td></tr>
<tr><td rowspan="6">Main steps</td><td colspan="5">Description of the normal sequence of events</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.1 M</td><td>Send actual EVSE status</td><td>EVSE</td><td>EVSE Operator</td><td>EVSE ID, EVSE status, Timestamp</td></tr>
<tr><td>2.1 M</td><td>Send actual EVSE status</td><td>EVSE Operator</td><td>MCH</td><td>EVSE ID, EVSE status, Timestamp</td></tr>
<tr><td>3.1</td><td>MCH transfers EVSE status to EVSP and Vehicle Service Provider</td><td>MCH</td><td>EVSP, Vehicle service provider</td><td></td></tr>
<tr><td>4.1 M</td><td>Show actual EVSE status</td><td>EVSP, Vehicle service provider</td><td>EV-Driver, e-Mobility customer</td><td>(EVSE ID), EVSE status</td></tr>
<tr><td rowspan="4">Extension</td><td colspan="5">Push mechanism from EVSE-operator backend</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>1.2 M</td><td>Search of EVSE-status</td><td>EV-Driver, e-Mobility customer</td><td>EVSP, Vehicle service provider</td><td>EVSE search criteria (e.g. location, charging mode)</td></tr>
<tr><td>2.2.1 M</td><td>Send actual EVSE search request</td><td>EVSP, Vehicle service provider</td><td>MCH</td><td>EVSE search criteria, EVSE ID</td></tr>
</table>

	3.2.1 M	MCH transfers EVSE search request to EVSE Operator and Vehicle Service Provider	MCH	EVSE operator	EVSE search criteria, EVSE ID
	4.2 M	EVSE Operator ask status to EVSE	EVSE operator	EVSE	EVSE search criteria, EVSE ID
	5 M	EVSE sends status to EVSE Operator	EVSE	EVSE operator	EVSE ID, EVSE status, Timestamp
	6.1 M	Check status of EVSE and send actual status	EVSE operator	MCH	EVSE ID, EVSE status, Timestamp
	7.1 M	MCH transfers status to EVSP and Vehicle Service Provider	MCH	EVSP, Vehicle service provider	EVSE ID, EVSE status, Timestamp
	8 M	Show actual EVSE status	EVSP, Vehicle service provider	EV-Driver, e-Mobility customer	(EVSE ID), EVSE status,
Extension	EVSE operator and EVSP communicate with direct communication				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	2.3 M	Send actual EVSE status	EVSE Operator	EVSP, Vehicle service provider	EVSE ID, EVSE status, Timestamp
	3.3	Step 3.1 is skipped			
	2.2.2 M	Send actual EVSE search request	EVSP, Vehicle service provider	EVSE Operator	EVSE search criteria, EVSE ID
	3.2.2	Step 3.2.1 is skipped			
	6.2 M	Check status of EVSE and send actual status	EVSE operator	EVSP, Vehicle service provider	EVSE ID, EVSE status, Timestamp
	7.2	Step 7.1 is skipped			
Post condition					
Security & Privacy Considerations					
Remarks	* Update frequency is depending on the EVSE-operator (CMS) The information from the actual EVSE status should not be older the 60 sec				

ERTICO project title: eMI^3

Document title: UCE Smart Charging

Electronic reference: eMI3-standard-v1.1-Part 1.docx

Main author(s) or editor(s): Ludovic Coutant (CNR)

Other author(s): Gilles Bernard (AFIREV/Gireve)

Kai Weber (Bosch)

Jan Wielling (Allego)

Jörg Seiffert (E-On)

Document history:

Version	Status	Date	Main author	Organisation	Summary of changes
0.1	Draft	01/12/2015	Ludovic Coutant	CNR	Initial Version
0.2	Draft	03/12/2015	Ludovic Coutant, Kai Weber & Gilles Bernard	CNR, AFIREV/Gireve & Bosch	Reviewed initial version
0.3	Draft	06/09/2017	Ludovic Coutant & Gilles Bernard	CNR & AFIREV/Gireve	Updated version with the introduction of complementary detailed use case elements
0.4	Draft	21/09/2017	Ludovic Coutant, Gilles Bernard, Jan Wielling, Jorg Seiffert	CNR, AFIREV, Allego, E-On	Updated version with correction of typos, addition of a periodical renegotiation and some remarks in goal and narrative, and in the remark section.
0.5	Final	6/10/2017	Ludovic Coutant, Gilles Bernard	CNR, AFIREV	Addition of an extension for interactions in between CEMS and the Energy market. Session info related remark at the end of the document.
1.0	Final	01/06/2018	Ludovic Coutant	CNR	Final version including comments of eMI3 members.

Keywords:

Smart	Charging	Backend	OEM
EVSP	EVSE Operator	CEMS	

<table>
<tr><td>Use Case ID</td><td>UCE S</td></tr>
<tr><td>Use Case Name</td><td>Smart Charging</td></tr>
<tr><td>Related UC</td><td>UC 200, UC 300, UC 310</td></tr>
<tr><td>Goal & Narrative</td><td>This use case element aims at providing the process steps of Smart Charging with a business level description.

More detailed use case elements are available with more comprehensive descriptions of exchanges of information at the system level:

• UCE S1 – Smart Charging with CEMS Backend
• UCE S2 – Smart Charging with Energy service provider Backend
• UCE S3 – Smart Charging with OEM Backend
• UCE SI – Smart Charging with ISO 15 118

This use case is organised into 6 steps:

1) Get vehicle’s status and requirements
2) Get user’s needs
3) Get charging conditions at the consumer level and on the energy markets
4) Get power grid conditions
5) Charging procedure
6) End of procedure

For better understanding, please refer to Smart Charging definition available in the eMI3 T&D.

For operational implementation of this use case, further documentation, such as interfaces or business objects, will be provided by eMI3 in a later stage. That additional information may be based on existing standard such as ISO 15 118, OCPP, … and describe the specific implementation of such standards in terms of the use case (profiling).</td></tr>
<tr><td>Actors</td><td>EVSE, EVSE Operator, CEMS, EVSP, MCH (Mobility Clearinghouse), Energy service provider, Energy market, DSO</td></tr>
<tr><td>Preconditions</td><td>All of the preconditions of the related UCs are met (UC 200, UC 300, UC 310)
EV Driver is plugged to an EVSE
EV Driver has been identified on the EVSE Operator backend with a valid eMA-ID
EVSP can be identified with a EVSP ID
EVSE Operator can be identified with a EVSE Operator ID
The charging process has started or is about to start
B2B contract between EVSP and EVSE Operator is optional</td></tr>
<tr><td>Main steps</td><td>Description of the normal sequence of events
<table>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td colspan="5">Get vehicle’s status and requirements</td></tr>
<tr><td>1 O</td><td>EV provides EV requirements and/or EV Status to EVSE Operator</td><td>EV</td><td>EVSE Operator</td><td>EV requirements and/or EV Status</td></tr>
<tr><td>2 O</td><td>EVSE acknowledge reception of EV requirements and/or EV Status to EV</td><td>EVSE Operator</td><td>EV</td><td>Acknowledge</td></tr>
<tr><td colspan="5">Get user’s needs</td></tr>
<tr><td>3.1 M</td><td>EV Driver provides charging requirements to EVSE</td><td>EV-Driver</td><td>EVSE</td><td>Charging requirements</td></tr>
</table></td></tr>
</table>

	4.1 O	EV Driver provides EV Status to EVSE	EV-Driver	EVSE	EV Status
	5.1 M	EVSE transfers charging requirements and optionally EV Status to EVSE Operator	EVSE	EVSE Operator	Charging requirements and optionally EV Status
	6.1 O	EVSE Operator acknowledge reception of charging requirements and/or EV Status to EVSE	EVSE Operator	EVSE	Acknowledge
	7.1 O	EVSE transfers acknowledgement to EV-Driver	EVSE	EV-Driver	Acknowledge
	Get local charging conditions and energy market's incentives				
	8 O	EVSE Operator requests charging conditions from CEMS	EVSE Operator	CEMS	Charging conditions
	9 O	CEMS sends charging conditions to EVSE Operator	CEMS	EVSE Operator	Charging conditions
	10.1 O	EVSE Operator requests best charging plan from Energy service provider	EVSE Operator	Energy service provider	Charging plan
	11.1 O	Energy service provider sends charging plan from EVSE Operator	Energy service provider	EVSE Operator	Charging plan
	12 O	EVSE Operator requests charging incentives from energy market	EVSE Operator	Energy market	Charging incentives
	13 O	Energy market sends charging incentives to EVSE Operator	Energy market	EVSE Operator	Charging incentives
	Get power grid conditions				
	14.1 O	EVSE Operator requests grid conditions to DSO	EVSE Operator	DSO	Grid conditions
	15.1 O	DSO sends grid conditions to EVSE Operator	DSO	EVSE Operator	Grid conditions
	Charging procedure				
	16 M	EVSE Operator sends charging profile to EVSE and optionally to the CEMS	EVSE Operator	EVSE CEMS (optionally)	Charging profile
	17 O	EVSE Operator periodically renegotiates the charging profile	Go to step 1 (step 3.1 and 3.2 becomes optional)		
	End of procedure				
	18.1 O	EVSE Operator sends Session info to EV	EVSE Operator	EV	Session info
	19 O	EVSE Operator sends Session info to CEMS	EVSE Operator	CEMS	Session info
	20 O	EVSE Operator sends Session info to Energy service provider	EVSE Operator	Energy service provider	Session info

	21 O	EVSE Operator sends Session info to Energy market	EVSE Operator	Energy market	Session info
	22 O	EVSE Operator sends Session info to DSO	EVSE Operator	DSO	Session info
Extension	EV-Driver sends Charging requirements through EVSP				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	3.2 M	EV Driver provides charging requirements to EVSP	EV-Driver	EVSP	Charging requirements
	4.2 O	EV Driver provides EV Status to EVSP	EV-Driver	EVSP	EV Status
	5.2.1.1 M	EVSP transfers Charging requirements and optionally EV Status to MCH	EVSP	MCH	Charging requirements and optionally EV Status
	5.2.2.1 M	MCH transfers Charging requirements and optionally EV Status to EVSE Operator	MCH	EVSE Operator	Charging requirements and optionally EV Status
	6.2.1 O	EVSE Operator acknowledge reception of charging requirements and optionally EV Status to EVSP through the MCH	EVSE Operator	MCH	Acknowledge
	6.2.2 O	MCH transfers acknowledgement to EVSP	MCH	EVSP	Acknowledge
	7.2 O	EVSP transfers acknowledgement to EV-Driver	EVSP	EV-Driver	Acknowledge
	18.2.1 O	EVSE Operator sends Session info to EVSP through the MCH	EVSE Operator	MCH	Session info
	18.2.2 O	MCH transfers Session info to EVSP	MCH	EVSP	Session info
Extension	CEMS request charging plan to Energy service provider instead of EVSE Operator				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	10.2 O	CEMS requests best charging plan to Energy service provider	CEMS	Energy service provider	Charging plan
	11.2 O	Energy service provider sends charging plan to CEMS	Energy service provider	CEMS	Charging plan
Extension	CEMS requests charging incentives to energy market instead of EVSE Operator				
	#	Process/Activity	Information Producer	Information Receiver	Information Exchanged
	12.1 O	CEMS requests charging incentives to energy market	CEMS	Energy Market	Charging incentives
	13.1 O	energy market sends charging incentives to CEMS	Energy Market	CEMS	Charging incentives

<table>
<tr><td rowspan="5">Extension</td><td colspan="5">CEMS request grid conditions to DSO instead of EVSE Operator</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>14.2 O</td><td>CEMS requests grid conditions to DSO</td><td>CEMS</td><td>DSO</td><td>Grid conditions</td></tr>
<tr><td>15.2 O</td><td>DSO sends grid conditions to CEMS</td><td>DSO</td><td>CEMS</td><td>Grid conditions</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="9">Extension</td><td colspan="5">EVSE Operator and EVSP communicate on a direct communication</td></tr>
<tr><td>#</td><td>Process/Activity</td><td>Information Producer</td><td>Information Receiver</td><td>Information Exchanged</td></tr>
<tr><td>5.2.1.2 M</td><td>EVSP directly sends Charging profile to EVSE Operator</td><td>EVSP</td><td>EVSE Operator</td><td>Charging profile</td></tr>
<tr><td>5.2.2.2 M</td><td>5.2.2.1 is skipped</td><td></td><td></td><td></td></tr>
<tr><td>6.3.1 O</td><td>EVSE Operator acknowledge reception of charging requirements to EVSP through the MCH</td><td>EVSE Operator</td><td>MCH</td><td>Acknowledge</td></tr>
<tr><td>6.2.2 O</td><td>MCH transfers acknowledgement to EVSP</td><td>MCH</td><td>EVSP</td><td>Acknowledge</td></tr>
<tr><td>18.3.1 O</td><td>EVSE Operator sends Session info to EVSP</td><td>EVSE Operator</td><td>EVSP</td><td>Session info</td></tr>
<tr><td>18.3.2 O</td><td>15.2.2 is skipped</td><td></td><td></td><td></td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>Post condition</td><td colspan="5">Charging ends</td></tr>
<tr><td>Security & Privacy Considerations</td><td colspan="5"></td></tr>
<tr><td>Remarks</td><td colspan="5">Steps 3 & 4 may occur in reversed order.
The relationship between the energy market players and the e-mobility players may significantly change because of the Clean Energy Package and cause modification of the Use Case Element.
A detailed definition of the session info is available in the T&D.</td></tr>
</table>