V1.0 Electric Vehicle ICT Interface Specifications

Part 2 : Business Objects

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Introduction

This part was developed in accordance to the procedures of the eMI3 standards group, in line with the NEMA ,working group “5EVSE”, IEC/ISO TC69 and have been adopted in the IEC15118 (vehicle to grid communication).

This part is presenting the Business objects that have been defined to allow the performance of eMI3 Use Cases described in Part 1.Those are:

- Search, Find and Reserve
- Basis Charging (with and w/o Roaming)
- Use Case Extension : Access Methods (e.g. RFID, Web App, Car with ISO/ IEC15118)

Scope

This eMI3 specification (industry standard) Part 2 covers the definition of the Business Objects to allow interoperability and is based on the Use Cases presented in eMI3 standard Part 1.

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

Library of Congress MARC Code List of Languages, US Library of Congress, 2007, http://www.loc.gov/marc/languages/language_code.html

IANA Time Zone Database, 2014, http://www.iana.org/time-zones.

NEMA EVSE 1.1, “EV Charging Network Interoperability Standards Framework” (Work in Progress)

NEMA EVSE 1.2, “A Contactless RFID Credential for Authentication (U_R Interface)” (Work in Progress)

NEMA EVSE 1.3, “QR Code and NFC Tags for EV Charging Station Identification (U_T Interface)” (Work in Progress)

NEMA EVSE 1.4, “Data Model and Protocols for Distributing Station Directories (I_D Interface)” (Work in Progress)

NEMA EVSE 1.5, “Authentication and Authorization Across EV Charging Networks (I_A Interface)” (Work in Progress)

NEMA EVSE 1.6, “Charging Session Status and Accounting Data Exchange (I_C Interface)” (Work in Progress)

Infomative 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_TermsAndDefinitions_v0.90.pdf

1 Unique Identifiers

1.1 Recommendations for all Identifiers

1.1.1 Persistency

The creation and assignment of identifiers must have the following properties:

- Each identifier MUST NOT be assigned to more than one object. These identifiers MUST be globally unique to ensure high confidence in identifying the object in the event disputes or audits arise.
- An identifier MUST be persistent and remain valid and unmodified until well after the lifespan of the object that it identifies. The implication is that the identifier may be used for referencing archived data, even if the object no longer exists. It is the responsibility of the issuing organization to ensure the above properties are adhered to. See details in chapter 1.4.

1.1.2 Privacy

The choice of identifiers MUST NOT directly reveal confidential information about Contracts and EVSE to third parties.

Since these IDs SHALL NOT change, tracking and profiling of charging habits is possible for intermediate systems. Therefore, confidential information (e.g. personal user data) linked to the identifiers SHALL never be communicated together with the identifier.

Through a simple mapping, organizations can continue to use already existing internal schemes of identifiers for the contracts of EVSP customers or EVSE.

1.1.3 Usage in IT-Systems

The IT systems implementing the specified identifiers SHOULD be able to cope with a field length of up to 255 characters, since future enhancements of this standard may require this.

The encoding of the data in IT systems SHALL be UTF-8 (cf. ISO/IEC 10646-1:2000, RFC 3629).

NOTE: UTF-8 allows for true international interoperability in case of enhancements of the defined identifiers for non-latin alphabet.

1.1.4 Implementation

Hierarchical information stored in the IDs defined here must not be used for any kind of operation or filtering that is not described in a Use-case chapter of this document

⇨ For instance country and location should be derived from attributes and not from country code of EVSE ID.

1.2 Electric Mobility Account Identification

1.2.1 Generic Rules

This chapter describes the relationship between EV owner, EV driver, eMobility account owner and eMobility tokens for two typical scenarios and shows the need to have an eMobility account and eMobility tokens for identification.

Several situations are considered for the identification of the electric Mobility account of an EV driver:

- Private EV driver scenario

The assumption is that an EV driver is the EV owner and always has an EV charging service contract and thus an account with a service provider (EVSP). This B2C contract will e.g. set up the charging services financial conditions

EV driver can have several tokens to refer to his charging service contract(e.g. Unique ID of an RFID card or user ID & password for a mobile app provided by the EVSP).

- Fleet scenario

In the fleet car business, the owner of the car could be different from the EV driver and from the charging service contract owner.

A car can serve several EV drivers and vice versa.

The tokens are managed by the fleet operator (for instance a rental car company). Those need a detailed record of the service per EV driver, so per Token.

Ex.: currently for instance, managers of company get a leasing car owned, they may own a fuel card. The company fleet manager has a global contract with fuel card provider to pay for the whole fuel consumption but he expects detailed record per card to check the consumption per manager. Several cards may be attached to one contract.

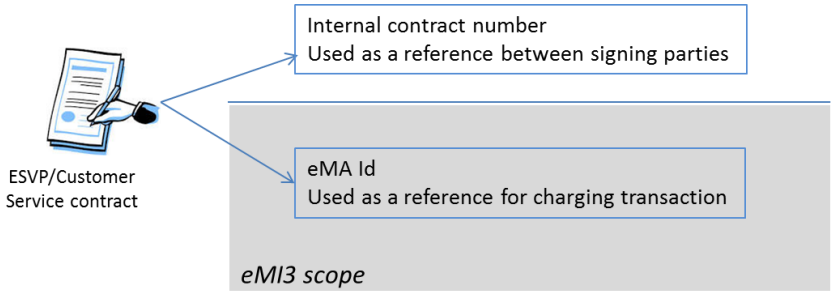
1.2.2 eMobility Account Identifier (eMA ID)

This identifier is called eMobility Account Identifier (eMA ID), as in ISO/IEC 15118. eMA ID refers to the account of an EVSP customer (with contract ID, service levels, etc.) and thus to any kind of an emobility service that the EVSP can offer to its customer (charging, search & find EVSE, …). The account here refers to services - as described in the contract - delivered to one specific customer (can be a private person, a company, a part of a company, etc.) and invoiced to this customer.

This standard does not support the EVCO ID Format defined within DINSPEC-91286. In chapter 1.2.2.4 is described how EVCO IDs can be migrated to eMA IDs.

Note: eMA ID is used in ISO/IEC 15118-2 Annex H.

Note: The eMA ID has the defined format as below. The format of the internal contract number is decided by the EVSP.



Picture p2-1: Items referring to a service contract

1.2.2.1 eMA ID Syntax

The eMA ID MUST match the following structure (the notation corresponds to the augmented Backus-Naur Form (ABNF) as defined in RFC 5234):

<eMA ID> = <Country Code> <S> <Provider ID> <S> <ID Type> <eMA Instance> <S> <Check Digit>

with

<Country Code> = 2 ALPHA

; two character country code according to ISO-3166-1 (Alpha-2-Code)

<Provider ID> = 3 (ALPHA / DIGIT)

; three alphanumeric characters, referring to the EVSP

<ID Type> = “C”

; one character “C” indicating that this ID represents a reference to a “Contract”

<eMA Instance> = 8 (ALPHA / DIGIT)

; eight alphanumeric characters referring to the internal service contract between EVSP and its customer

<Check Digit> = *1 (ALPHA / DIGIT)

; Optional but highly recommended,

see appendix for its computation

ALPHA = %x41-5A / %x61-7A

; according to RFC 5234 (7-Bit ASCII)

DIGIT = %x30-39

; according to RFC 5234 (7-Bit ASCII)

<S> = *1 (“-”)

; optional separator

An example for a valid eMA ID therefore is “DE8AACA2B3C4D5L” or with dashes “DE-8AA-CA2B3C4D5-L”.

Note: This identifier definition is a more precise interpretation of ISO/ IEC 15118 eMA ID Id in a sense that ISO/IEC 15118 eMA ID is proposing an instance of 9 Alpha/digits.

eMA ID is splitting this instance in 2 parts: an Id type of 1 Alpha/Digit and an instance of 8 Alpha/digit. This ID type is aiming at differentiating EVSE Id, EVSE Pool Id and eMA ID (see after)

<ISO 15118 eMAID ID Instance> = <eMI3 eMA ID ID Type> <eMI3 eMA ID Instance>

Alpha characters SHALL be interpreted case insensitively.

Even though all valid formats of eMA ID shall be readable to ensure compatibility with ISO IEC 15118, eMI3 strongly recommends that implementations SHOULD

- use the separator: for sake of readability
- use the checksum: to avoid typo errors

1.2.2.2 eMA ID Semantics

The eMA ID MUST be interpreted case insensitive, i.e. “DE8AACA2B3C4D5L” is exactly the same ID as “de8aACA2b3C4d5l”. A hyphen (“-“) may be used as separator in communication with users of EV or EVSE to allow for better reading, spelling and typing. An example for such an illustration is “DE-8AA-CA2B3C4D5-L”. If such an illustration is chosen, the separators MUST be set at all three places. Each eMA ID MUST have a fixed length of at least fourteen and at most fifteen characters excluding the optional separators or at least seventeen respectively and at most eighteen characters including the optional separators. While the Provider ID MUST be assigned by an issuing authority (see 1.4), each EVSP with an assigned Provider ID SHALL choose the eMA Instance within the above mentioned rules freely.

1.2.2.3 Calculation of the Check Digit

An alphanumeric character is calculated with the first 14 character of the <eMA ID> and attached at the 15th position of the eMA ID. For details on the calculation see Annex 1:

1.2.2.4 Backwards Compatibility to DIN SPEC 91286

Contract IDs as defined in DIN SPEC 91286 can be used in this new proposed format by adding “C0” at the beginning of the <eMA Instance>-part and the old check digit at position 14.

Example: DE-8AA-123A56-3 is interpreted as DE-8AA-C0123A563-Checksum

1.2.3 eMobility Token ID (eMT ID)

The eMT ID is used for authorisation (e.g. at a charging station) with the aim to link to the EV driver's eMA ID. One eMT ID provides a unique link to one eMA ID.

The eMT ID can be used to identify any identification token for e-mobility. The eMT ID is expected to be unique but not linked to a country or operator/provider.

Each eMT ID SHALL consist of a token value and at least the token type. The sub-type is for further specification of the general token type.

Field Name	Optional	Description
Token Value	Mandatory	The format specification depends on the token type.
Token Type	Mandatory	The type of the supplied value.
Token Sub Type	Optional	The exact type of the supplied value.

Table p2-2 : Token description

The synthax of the Token Value SHALL be of at most 512 alphanumeric characters with

ALPHA = %x41-5A / %x61-7A

; according to RFC 5234 (7-Bit ASCII)

DIGIT = %x30-39

; according to RFC 5234 (7-Bit ASCII)

Examples for a Token Value are: UUID for RFIDs or password for user-ID & password identification.

1.2.3.1 *eMT ID Token Types*

The type of the supplied token value for basic filtering. The token sub type is the exact type of the supplied value for referencing purpose.

Token Type	Description	Token Sub Type	Description
RFID	All kinds of RFID-Cards. The token value holds the hexadecimal representation of the card's UID, Byte order: big endian, no zero-filling.	mifareCls	Mifare Classic Card
		mifareDes	Mifare Desfire Card
		calypso	Calypso Card
		nfc	NFC (Near Field Communication)
Remote	All means of remote authentication through the backend.	app	smartphone app EVSP
		desk	Serice desk e.g. via phone call
		sms	SMS e.g. SMS payment
15118	All authentication means defined by ISO/IEC 15118 except RFID-cards.		

Table p2-3 : Token type list

1.3 EVSE Identification

1.3.1 General Description

In order to perform search and find or authentication Use cases, the set-up of identifiers referring to the charging poles are mandatory.

An EV driver is essentially connecting the car to an EVSE. In Authentication process, a link between the eMA Id and the EVSE is mandatory. Therefore a global ID for EVSE is defined.

The use case search and find describes how an EVSP may search for and find one or more EVSE from one or more EVSE Operators

The EVSP can set search criteria on any attribute or ID of the data model, for instance location:

- with at least one charging station accessible (correct operating hours, no access restrictions, payment method / authentication)
- with an EVSE available and working (option)
- with at least one socket / outlet compatible with the car (cable, type of power, supplier restriction)
- with a capability to supply power fitting the EV/driver requirements
- with common energy supply, with common point of delivery, with common internet connection …

Therefore, the charging infrastructure data object SHALL be a 4 level data structure:

- **Level 1: “Pool”**

  The use case search and find is describing the navigation service that guides EV driver to a location where he can charge his EV.

  Taking into consideration that an EVSE Operator can have several charging station close to each other, those will be represented as a group of stations called a POOL.

  So a Pool is a grouping of charging stations that share close location. This group should gather stations sharing the same electric cabinet and/or a common connexion to the back-end. It is the responsibility of the EVSE Operator to group them in the most convenient/ viewable way for the driver.

  This POOL shall be the root of the data exchange between Search and find Service provider and EVSE Operator. That is to say, POOL is the object exchanged in Search and find Service.

  However, future grouping or consolidation could be considered, for instance for load management services or different grouping for exchanges between service providers. Therefore, a specific mandatory attribute is joined to the Pool: pool type.

  The value defined for “Search and Find” Service is: locationPool

- **Level 2: "Charging Station"**

  A station is a physical grouping of one or more EVSEs, sharing a common user identification interface..

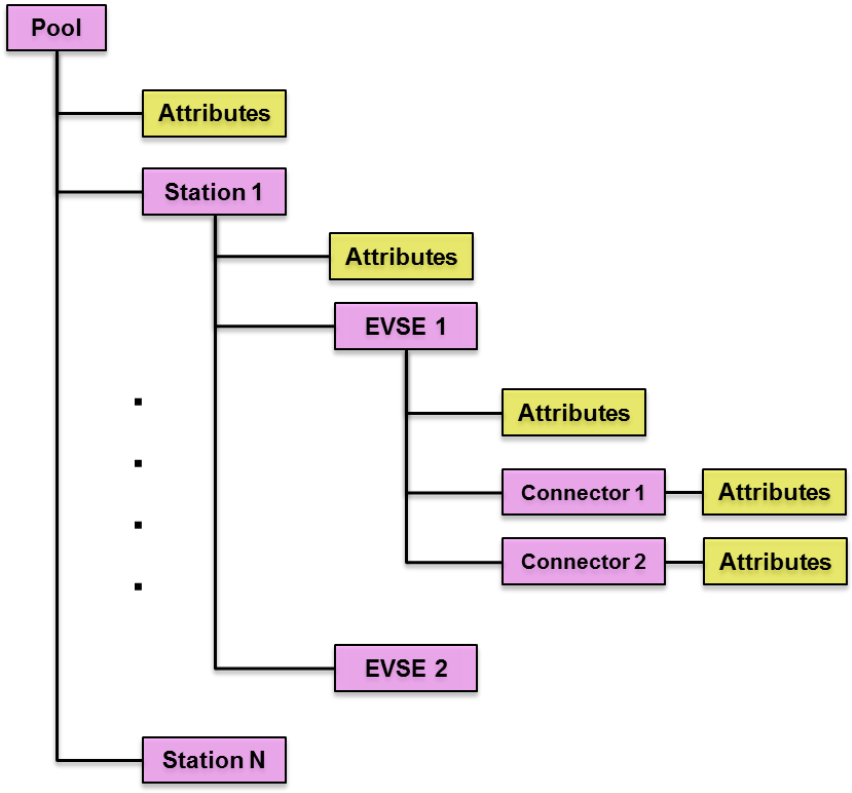
- **Level 3: "EVSE"**

  EVSE is the part of a station that will handle the charging process of one EV at a time and may have one meter. An EVSE may have one or several connectors but only one can be used at the same time.

- **Level 4: "Connector"**

  The connector is the physical interface connecting to the car. It SHALL follow one of international standards listed in chapter 2.4.1.

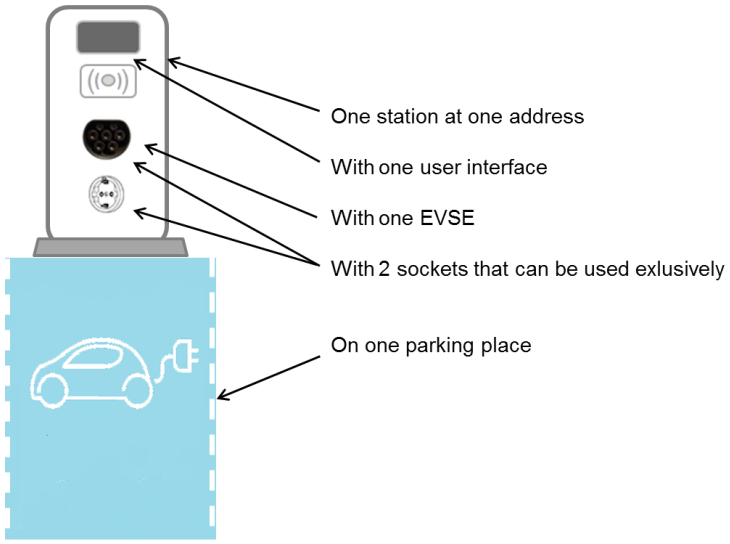
Note: The name used in ISO/IEC 15118 is "socket outlet" and eMI3 decided for "connector" as it is more general – including wireless charging – and it covers EVSEs with an attached cable e.g. for DC fast charging. The figure that follows is a schematic of charging infrastructure data object:



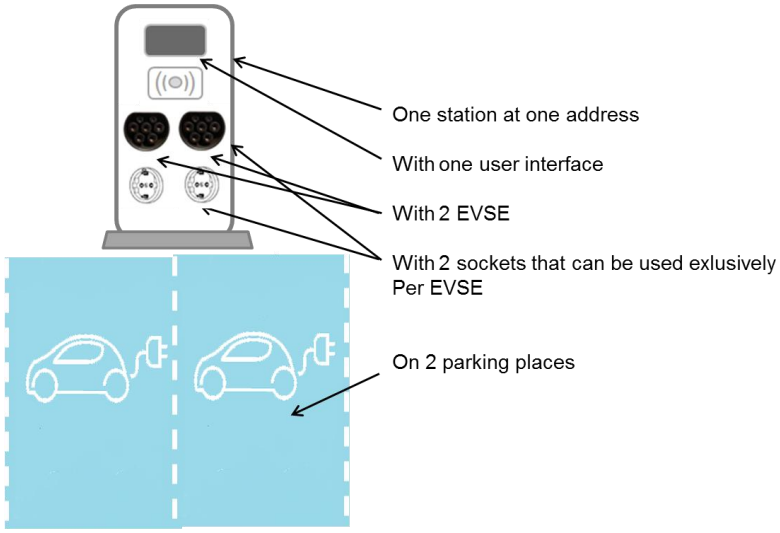
Picture p2-4 : schematic of charging infrastructure data object

Examples of public charging infrastructure :

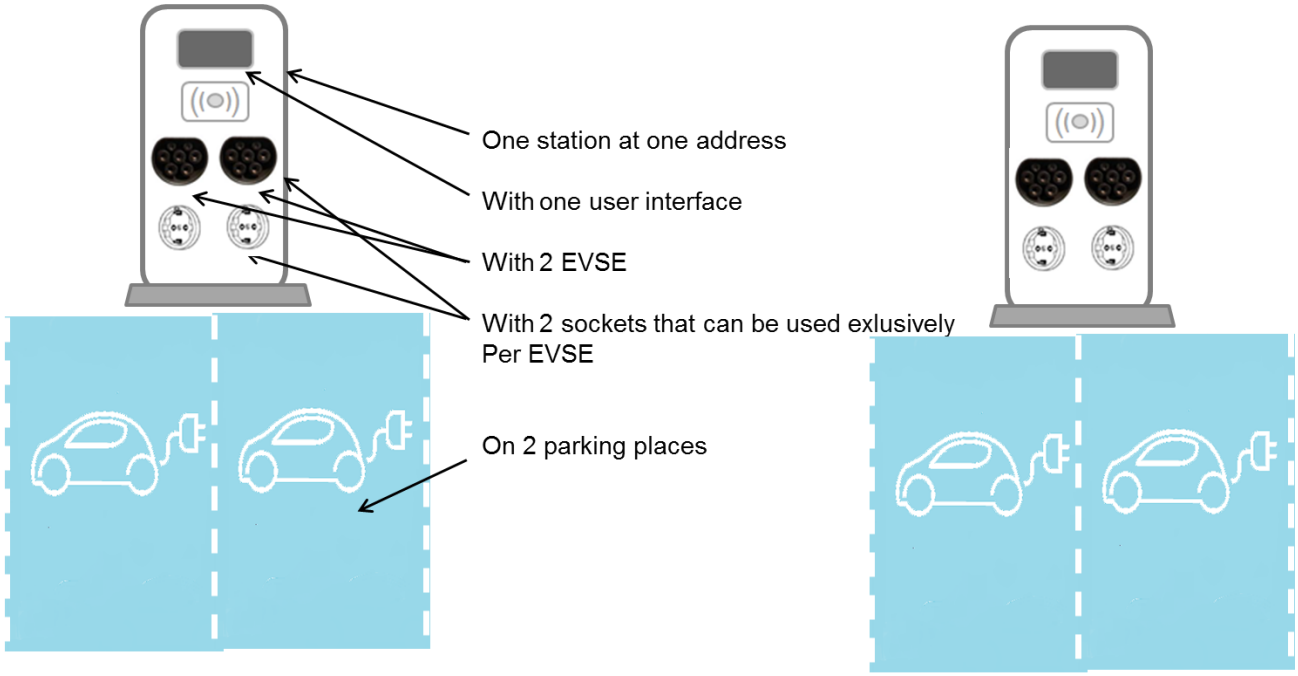
1. Picture p2-5 : one pool made of single charging station with one EVSE



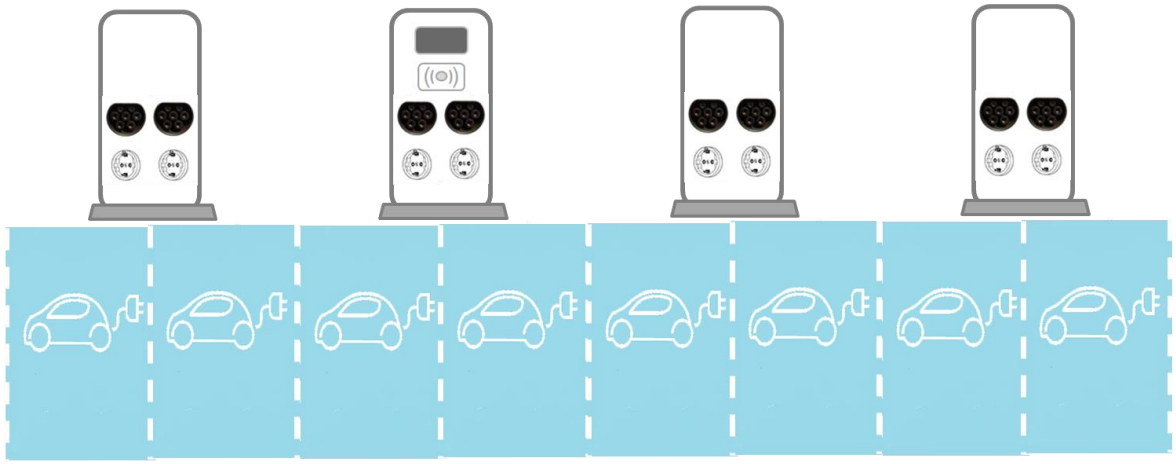
2. **Picture p2-6 : One pool made of one single charging station with two EVSE**



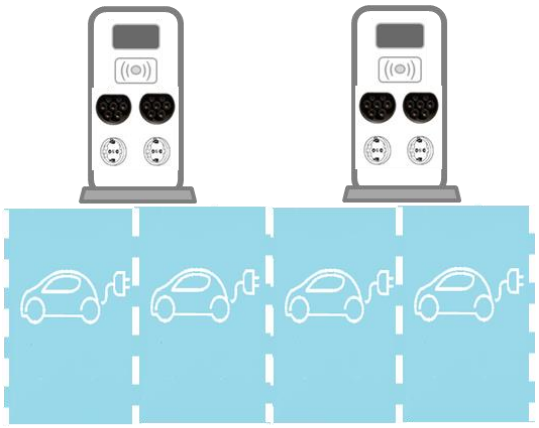
3. **Picture p2-7 : two pools at 2 different addresses with one charging station with two EVSE each**



4. **Picture p2-8 : One pool at one address made of one station with 8 EVSEs**

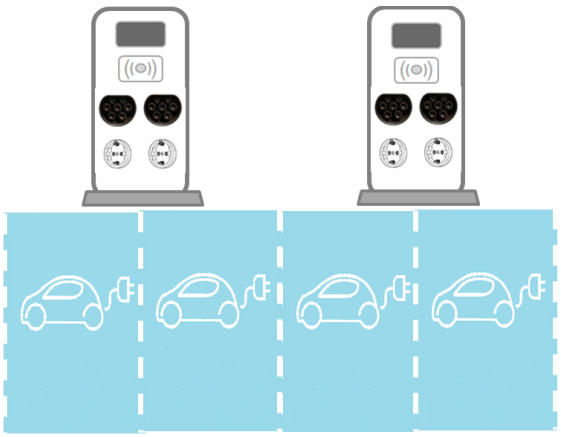


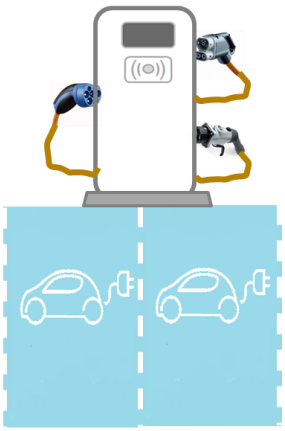
5. **Picture p2-9 : One charging pool with two charging stations**



One pool made of 2 stations each made of 2 EVSEs, at the same address

6. **Picture p2-10 : one charging pool with 3 charging stations : one quick charger and 2 standard stations with 2 EVSE each**





7. **Picture p2-11 : two charging pools and four charging stations at one same address**

One pool made of one Quick charge station able to serve AC and one DC simultaneously (1 EVSE AC side, 1 EVSE DC side)
And One pool dedicated to car sharing with 3 stations of 6 EVSE each

The following identifiers MUST be globally unique as they are aimed at being exchanged between EVSE operators and EVSPs:

Pool level requires a globally unique identifier called: EVSE Pool ID (see chapter 1.3.2.3.)

Charging Station level doesn't require any global identifier, but local,

EVSE level requires a globally unique identifier called: EVSE ID (see chapter 1.3.2.1)

Connector level doesn't require any global identifier

1.3.2 Electric Vehicle Supply Equipment ID (EVSE ID)

1.3.2.1 EVSE ID Syntax

The EVSE ID MUST match the following structure (the notation corresponds to the augmented Backus-Naur Form (ABNF) as defined in RFC5234):

<EVSE ID> = <Country Code> <S> <Spot Operator ID> <S> <ID Type> <Power Outlet ID>

with

<Country Code> = 2 ALPHA

; two character country code according to ISO-3166-1 (Alpha-2-Code)

Country Code SHALL represent the country where the EVSE is installed.

<Spot Operator ID> = 3 (ALPHA / DIGIT)

; three alphanumeric characters, defined and listed by eMI3 group, referring to the EVSE Operator

<ID Type> = “E”

; one character “E” indicating that this ID represents an “EVSE”

<Power Outlet ID> = (ALPHA / DIGIT)1 * *30 (1*(ALPHA / DIGIT) / [<S>])

; between 1 and 31 sequence of alphanumeric characters or separators, including additional optional separators start with alphanumeric character, internal number allowing the EVSE Operator to identify one specific EVSE

ALPHA = %x41-5A / %x61-7A

; according to RFC 5234 (7-Bit ASCII)

DIGIT = %x30-39

; according to RFC 5234 (7-Bit ASCII)

<S> = *1 (“*”)

; optional separator

An example for, a valid EVSE ID is “FR*A23*E45B*78C” with “FR” indicating France, “A23” representing a particular EVSE Operator, “E” indicating that it is of type “EVSE” and “45B*78C” representing the power outlet ID, that is to say one of its EVSEs.NOTE: In contrast to the eMA ID, no check digit is specified for the EVSE ID in this document.

Alpha characters SHALL be interpreted case insensitively.

Even though all valid formats of EVSE Id SHALL be readable to ensure compatibility with ISO/IEC 15118, eMI3 strongly recommends that implementations SHOULD

- use the separator between country code and Spot Operator ID
- use the separator between Spot Operator ID and ID type

NOTE : ID Type
The ID Type is used to distinguish ID e.g. between eMA ID and EVSE ID

NOTE : Power Outlet ID
The Power Outlet ID SHALL uniquely identify one EVSE within an EVSE Operator domain over the life time of the EVSE.

1.3.2.2 EVSE ID Semantics

Each EVSE ID SHALL have a variable length with at least seven characters (two characters for Country Code, three characters for Spot Operator ID, one character for ID Type, one character for Power Outlet ID) and at most thirty-seven characters (two characters for Country Code, three characters for Spot Operator ID, one character for ID Type, thirty-one characters for Power Outlet ID). While the Spot Operator ID must be assigned by an issuing authority (see 1.4), each EVSE Operator with an assigned Spot Operator ID SHALL choose the Power Outlet ID within the above mentioned rules freely

1.3.2.3 EVSE Pool ID

Country Code:
Country Code SHALL represent the country where the POOL is implemented .

Spot Operator ID:
The Spot Operator ID SHALL be a unique ID issued in a country and identifies an EVSE Operator.

ID Type:
The ID Type is used to distinguish ID e.g. between eMA ID and EVSE ID

Pool Instance:
The Pool Instance SHALL uniquely identify one pool for charging stations within an EVSE Operator charging management system.

1.3.2.4 EVSE Pool ID Syntax

The EVSE Pool ID MUST match the following structure (the notation corresponds to the augmented Backus-Naur Form (ABNF) as defined in RFC5234):

<EVSE Pool ID> = <Country Code> <S> <Spot Operator ID> <S> <ID Type> <Pool ID>

with

<Country Code> = 2 ALPHA

; two character country code according to ISO-3166-1 (Alpha-2-Code)

<Spot Operator ID> = 3 (ALPHA / DIGIT)

; three alphanumeric characters, (see paragraph 1.4 for definition)

<ID Type> = “P”

; one character “P” indicating that this ID represents a “Pool”

<Pool Instance> = (ALPHA / DIGIT) 1 * 30 (1*(ALPHA / DIGIT) [/ <S>])

; between 1 and 31sequence of alphanumeric characters, including additional optional or separators, start with alphanumeric character, referring to a specific Pool in EVSE Operator data system.

ALPHA = %x41-5A / %x61-7A

; according to RFC 5234 (7-Bit ASCII)

DIGIT = %x30-39

; according to RFC 5234 (7-Bit ASCII)

<S> = *1 (“*”)

; optional separator

An example for a valid EVSE Pool ID is “IT*123*P456*AB789” with “IT” indicating Italy, “123” representing a particular Spot Operator, “P” indicating the Pool and “456*AB789” representing one of its POOL.

NOTE: In contrast to the eMA ID, no check digit is specified for the EVSE Pool ID in this document.

Alpha characters SHALL be interpreted case insensitively..

eMI3 strongly recommends that implementations SHOULD

- use the separator between country code and spot operator Id
- use the separator between spot operator id and ID type

1.3.2.5 EVSE Pool ID Semantics

Each EVSE Pool ID SHALL have a variable length with at least seven characters (two characters for Country Code, three characters for Spot Operator ID, one character for ID Type and one character Pool Instance) and at most thirty-seven characters (two characters for Country Code, three characters Spot Operator ID, one character for ID Type and thirty-one characters for Pool Instance).

While the Spot Operator ID MUST be assigned by an issuing authority (see 1.4), each EVSE Operator with an assigned Spot Operator ID SHALL choose the Pool Instance within the above mentioned rules freely.

1.4 Issuing of Unique IDs

As presented in sections 1.2 and 1.3, the IDs are made of 3 major parts:

- A country code
- An EVSP/EVSE Operator ID respectively called “Service Provider ID” and “spot Operator ID”
- And a local instance called “eMA Instance” for the eMA ID and “power outlet ID” for the EVSE ID and “Pool Instance” for the EVSE Pool ID

The combination of “Country Code” and “Service Provider ID” is unique and is called “Global service provider ID”

The combination of “Country Code” and “Spot Operator ID” is unique and is called “Global Spot operator ID”

1.4.1 Issuing of global identifiers

1.4.1.1 Issuing of Global Spot Operator IDs

Global Spot Operator ID issuing refers to the registration of operators, via attribution of a global identifier.

The country code of EVSE ID refers to the country where poles are located. Any Operator shall be registered by the local issuing authority for every country he is operating in. Hence, “Country code” + “Spot Operator Id” is a unique information referring to an Operator operating poles in a specific country.

An operator can apply to get the same Spot Operator Id in every country they are operating in.

A station is owned by a company, located in a place owned by a second and operated by a third one, but in any case, the Global Spot Operator ID refers to the company that is signing B2B contracts with EVSP or Clearing House and who is charging money for the charge.

1.4.1.2 Issuing of Global Service Provider-IDs

The country code of eMAID refers to the country where the contract between customer and EVSP has been made. Any EVSP shall be registered by the local issuing authority for every country he will perform charging service. Hence, “Country code” + “Service Provider Id” is a unique information referring to an Provider operating charging services in a specific country.

An EVSP can apply to get the same Service Provider Id in every country he is issuing customer contracts.

1.4.1.3 Generic rule

In case a company operating under a Global Operator Id is changing legal status (for instance, activity sold to another company…), this company or the new operating company can request an ID change in case B2B contracts with EVSP/EVSE Operator and Clearing House are modified. The issuing entity shall give final approval.

1.4.2 Issuing of local Instances

It is the responsibility of the EVSE operator or the EVSP to issue and maintain its instance list

1.4.2.1 Power outlet ID

Any operator has the right to change the Power outlet ID in case of:

- charging station relocation
- replacement of any station
- modification of any attribute of the pool

But in order to ensure proper performance of the Service, operator shall make best efforts to update information system of EVSPs and Clearing Houses having a B2B relationship with him.

When a charging station is removed, Power Outlet ID should never be reused and in any case, shall not be reused before 180 days.

1.4.2.2 POOL Instance

POOL Instance is under full responsibility of EVSE Operator. EVSE belonging to this POOL and the POOL should have coherent instances, for instance, first digits of EVSE Instance shall refer to the Pool Instance.

1.4.2.3 eMA ID

An eMA ID remains active until the contract it refers to comes to a stop.

It is EVSP's responsibility to decide which event shall lead to a contract end.

An eMA ID shall not be reused.

1.4.2.4 eMT ID

eMT are issued by the EVSP. An eMT ID refers to only one eMA ID but an eMA ID can group several eMT IDs. eMT ID can be reassigned to another eMAID.

However, if eMA ID and contract are still in operation, the eMT can not be transferred to another eMA ID

In any case, eMT ID shall not be reused before 180 days in order to make sure that charging pole white/black lists have been updated. EVSP shall make best efforts to inform his partners (EVSE Operator, Clearing houses, other service providers).

2 Charging Station Business Object

This section is aiming to describe and organize all of the physical, geographical and electrical features of charging stations.

These features will enable the performance of every Use Case described in part one with reference to a charging station, with a specific focus on “Search and Find Use-case”

As described before every level describing a charging station has specific attributes. This Chapter describes them, from the pool to the connector level.

The encoding of the data in IT systems SHALL be UTF-8 (cf. ISO/IEC 10646-1:2000, RFC 3629).

Note : only attribute describing the charging stations are considered. If ever some more attributes should be used for implementation (such as but not limited to last update date), those will be presented in Part 3. Along with this rule, no attribute shall be a computation of elements from the data structure (such as for instance number of charging station per pool); it is the responsibility of service provider to make its computations.

The “Instance” column (hereafter “Inst”) represents the number of values an attribute can have : “0” meaning the attribute can be optional, “n” meaning the attribute has no limited number of values.

2.1 Pool Attributes

As defined in chapter 1.3.1, Pool attributes may change depending on the pool type.

Therefore, the following table is listing the attributes corresponding to poolType = locationPool (that is to say the poolType related to Search and find Use Case) and global attributes used by any kind of pool.

- Attribute related to locationPool : value L
- Transversal attribute : value G

Table p2-11 : Pool attributes

ATTRIBUTE	DEFINITION	Status	INST.	FORMAT
EVSE Pool ID		G	1	See chapter 1.3.2.3
PoolType	Type of the pool. At present only locationPools are define.	G	1	Value: locationPool
Name	Official name of the Pool	G	1	Canonical text (white space transparent).
Description	A free form textual description of a pool.	G	0..n	Multi-lingual text. One instance per language.
LocationInfo	Location of pool (see chapter 2.2.1). Location info must be present in at least the pool and/or charging stations levels.	L	1	"LocationInfo" complex type
TimeZoneOffset	The timezone in effect at the pool location (and all contained charging stations). The timezone is expressed as an offset from UTC. This timezone value is used to help convert from UTC time to local time. Note that TimeZoneName is preferred over TimeZoneOffset if both are present.	L	0..1	+/- x /UTC (a decimal from 0-23.99).
TimeZoneName	The time zone name per the IANA Time Zone Database, which is also referred to as the Olson Database. The most specific time zone name matching the location of the pool should be chosen. Examples of time zone names include “Europe/Brussels” or “Europe/Paris”, even though both of these share the same UTC offset and daylight savings time adjustments. However, in general, the UTC offsets and daylight saving time shifts may vary from one time zone name to another. Note that TimeZoneName is preferred over TimeZoneOffset if both are present.	L	0..1	Please refer to the time zone names found in the http://www.iana.org/time-zones/repository/tz-link.html)
PoolContactInfo	Pool owner contact details	G	0..1	structure detailed in sheet "contact structure"
OperatorContactInfo	Pool Operator contact details	G	0..1	structure detailed in sheet "contact structure"
OpenHours	The weekdays and times-of-day when the pool of charges can be accessed by public users. This time structure relates to the accessibility of the parking spaces near the pool of EV chargers.	G	0..n	"OpenHours" complex type
Administrative State	allow navigation map providers to identify evolutions	L	0..1	AdministrativeState complex type
OtherAttributes	Name value pair strings can hold extension attributes that have not yet been standardized or custom information for operator use.	G	0..n	"NameValuePair" complex type

2.1.1 Contact Structure

Table p2-12 : Contact Structure

ATTRIBUTE	DEFINITION	INST.	FORMAT
RoleId	The contact's role. There are contact information for the EVCSO, the EVSP, etc.. The RoleId identifies the role that the contact plays.	0..1	Alpha/Digit
Name	Name of the entity assuming the role (Pool owner of Pool operator)	1	
Description	A free form description of the contact.	0..1	Text
AddressLine1	The house and street address.	0..1	Text
AddressLine2	Another supplemental address line (e.g., apartment number)	0..1	Text
City	The city where the contact is located at.	0..1	Text
State-Province	The state or province where the contact is located at.	0..1	Text
PostalCode	The postal code where mail should be sent to the contact.	0..1	Text
Country	The country where the contact resides.	0..1	ISO 3166 country code
ContactDetails	Company contact means	0..1	See chapter 2.1.1.1
LanguageCode	Indicates the default language used for given method of contact (if multiple languages supported)	0..1	IETF BCP-47 scheme (ISO 639 language codes+ ISO 3166 Country codes): ex. en-US, en-GB, fr-FR, fr-CA
LocationMainContact	Value is set to "N" if EVSP should be the main contact for customer. Value is set to "Y" if Customer can contact directly CPO. Value can be "Y" only if contact details have been provided	0..1	"Y" or "N"

2.1.1.1 Contact Detail Description

An EV Driver may need to get in touch with EVSE Operator in case of problems such as for instance a cable remaining locked after charging session. Those attributes allow EVSP to provide contact data that customer should use. Those are split per type of concern (main = generic, commercial and technical)

Table p2-13 : Contact Detail Attributes

Contact Details		Inst.	
Main company contact	**website**	0..1	text
	email	0..1	text
	Fixed phone	0..1	international format
	Mobile phone	0..1	international format
	facsimile	0..1	international format
	preferred contact way	0..1	"Y" or "N"
Commercial assistance	**website**	0..1	text
	email	0..1	text
	Fixed phone	0..1	international format
	Mobile phone	0..1	international format
	facsimile	0..1	international format
	preferred contact way	0..1	"Y" or "N"
Technical assistance	**website**	0..1	text
	email	0..1	text
	Fixed phone	0..1	international format
	Mobile phone	0..1	international format
	facsimile	0..1	international format
	preferred contact way	0..1	"Y" or "N"
Booking	**website**	0..1	text
	email	0..1	text
	Fixed phone	0..1	international format
	Mobile phone	0..1	international format
	facsimile	0..1	international format
	preferred contact way	0..1	"Y" or "N"

2.2 Charging Station Attributes

The table p2-14 below describes the data attributes within the charging station business object. In the description of the data attributes, the term “Text” is used in the “FORMAT” column to denote the use of text strings. In addition, text strings are further described to have the following characteristics:

1. Length: “short” or “long”. A short string is a free-form text string of length 64 characters or less. A long string is a free-form string of length 1024 characters or less. These sizes are used to help ascertain storage requirements.
2. Language: “multi-lingual” indicates meta-data is present to indicate the language associated with the text string. Its use is similar to the “xml:lang=en” attribute. When a text string object has more than 1 string instances, each instance is for a different language. Note that only one instance per language is permitted. The treatment of a set of different language text strings is analogous having internationalized code table pages. For example, a system wishing to display only English language text will use only the text objects with attributes that match the desired language, while ignoring the other languages. If the desired language is not present, the choice of which string to use is implementation dependent. Some implementation may choose to translate or find the closest matching language, while other implementations may choose to use the first text string. In the absence of a text language attribute, the text is assumed to be in the English language.

Table p2-14 : Charging Station Attributes

ATTRIBUTE	DEFINITION	INST.	FORMAT
StationId	A locally unique identifier for the charging station.	1	Alphanumeric
Label	This attribute should reflect the identification label displayed on the charging station for the purpose of distinguishing and finding a charging station among several in the same vicinity and type. This string should be the same as what is visible to a customer when a customer is standing in front of the charging station. Example: The labels may correspond to signage like "1", "2", "3" to help distinguish each of 3 different charging stations.	1	Text: short
LastUsedTime	The last time charging service was successfully provided to an EV without incurring a fault during the session.	0..1	ISO 8601, yyyy-mm-ddThh:mm:ssZ ex. 1977-04-22T06:00:00Z. Time zone offset must be specified.
AdministrativeState	Administrative state of the charging station.	0..1	“AdministrativeState” complex type.
Manufacturer	This attribute identifies the manufacturer of the charging station. The manufacturer is often the designer and producer of the charging station, although an charging station may be re-branded, in which case the re-branded name is used).	0..1	Text: short
Model	This attribute identifies the manufacturer's model number for the charging station. This information might be useful for an EV driver to know whether he/she are familiar with the equipment based on prior usage.	0..1	Text: short

ATTRIBUTE	DEFINITION	INST.	FORMAT
StationType	This attribute indicates whether a charging station is fixed or mobile. For fixed charging stations, the charging station is situated at the same place for long periods of time. A mobile charging station may be moved from one location to another as demand dictates. Examples of mobile charging stations include: a.) a temporary EV chargers deployed to support special events like concerts or sports event, or b.) demonstrations platforms. Mobile charging stations are modelled in the same manner as “fixed” charging stations. They may be in groups, and a single mobile charging station may have multiple EVSEs.	0..1	Enumerated values: “fixed”, and “mobile”. If this attribute is not present, the station is considered “fixed” by default.”
LocationInfo	Location of the station if different from the pool location; otherwise the address information is inherited from the pool. Must be specified at pool level and/or charging station level.	0..1	LocationInfo complex type
AuthorizationMethods	Rfid, PLC, phone (can be more than one)	0..n	See chapter 2.2.8.
UserInterfaceFeatures	The set of user interface features supported on the station.		"UserInterfaceFeatures" complex type
ServicePlan	The set of service plans available/supported at the charging station.	0..n	"ServicePlan" complex type
OpenHours	The days-of-a week and time-of-day when the charging station can provide EV charging services to public users. Some charging stations are available only during certain times of the day for public charging and may be restricted to other users at other times		"OpenHours" complex type
ParkingInfo	Parking information	0..1	"ParkingInfo" complex type
UserComments	User comments as provided by Drivers	0..n	"UserComment" complex type
ServiceProviderComments	A free form text description of the charging station as provided by the EVSP	0..n	Text: multi-lingual, long
OtherAttributes	Name value pair strings can hold extension attributes that have not yet been standardized or custom information for operator use.	0..n	"NameValuePair" complex type

2.2.1 LocationInfo

Table p2-15 : location info sub attributes

ATTRIBUTE	DEFINITION	INST.	FORMAT
Name	Official name of the location.	1..n	Text: multi-lingual, short
Description	Specific details about the surrounding environment (restriction).	0..n	Text: multi-lingual, long
PropertyOwner	Location owner contact details	0..1	Text: long
AddressLine1	A combined address with both the building number and street name/number on a single line.	0..1	Text: short
AddressLine2	Additional more specific address information for unit numbers like condominium/apartment numbers.	0..1	Text: short
BuildingNumber	The building number like that used in France. if applicable, which house number could be linked with the EVSE	0..1	alpha/digit
StreetName	if applicable, which street name could be linked with the EVSE	0..1	Text: short
Storey	In which storey/underground the station is if it's in a parking, building.	0..1	Text: short
PostalCode	The postal code for the location.	0..1	digits
PostalCodeSub	if applicable	0..1	alpha/digit
City	In which city the pool is located	1	Text: short
AdministrativeArea	if applicable, In which administrative area the Pool is located	0..1	Text: short
Country	In which country the station is located	1	ISO 3166 country code 3 alpha
GeoCoordinate	Geographical coordinate information giving the precise location of a pool or charging station.	1	"GeoCoordinate" complex type
ParkingEntranceGeoCoordinate	Geographical coordinate for parking entrances. This attribute should be omitted if a separately identifiable parking entrance does not exist or the entrance is the same as the location of the charging station. There can also be multiple parking entrances leading to the pool or charging station.	0..n	"GeoCoordinate" complex type

2.2.2 GeoCoordinate

Table p2-16 : Geo coordinate attributes

ATTRIBUTE	DEFINITION	INST.	FORMAT
Latitude	Latitude (X coordinate)	1	MUST USE "real number" precision notation DDD.DDDDD, which has precision to 1 meter. WGS84 is assumed unless specified by the attribute "CoordinateSystem".
Longitude	Longitude (Y coordinate)	1	MUST USE "real number" precision notation DDD.DDDDD, which has precision to 1 meter. WGS84 is assumed unless specified by the attribute "CoordinateSystem".
Altitude	Altitude (Z coordinate). Altitude coordinate may be omitted if not available.	0..1	"Real number" in meters.
CoordinateSystem	WGS84 or other coordinate system applies to the information	0..1	Enumerated list: "WGS84", "GRS80", etc.. If this datum is not specified, "WGS84" is assumed as the default.

2.2.3 AdministrativeState and OperationalState

The AdministrativeState indicates whether a pool or charging station t is able to provide service. If a pool or charging station is not able to provide service, some additional detail is given as to the reason it is not available.

Table p2-17 : Administrative state attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
AdminState	This attribute indicates whether the associated object is provisioned to provide service (or not). It gives the desired/intended service state of the associated object as declared by the operator. If the associated object is found to be unfit to provide service, it will typically be placed in an out-of-service or in-maintenance state.	1	See Table below
EventTime	Time of transition to the indicated state.	0..1	ISO 8601 UTC Time. Time zone offset must be specified.

The definitions for AdminState are as follows:

Planned / In-deployment	The object is planned or under construction.
In-Maintainance	The object is not ready to provide service because it is under maintenance.
In-Service	The object is provisioned/enabled to provide service (e.g., ready or is charging)
Out-of-Service	The object is not enabled to provide service for any reason, including detection of a fault.
Deleted	The object no longer exists. It has been decomissioned or removed.

The OperationalState reflects the actual status of an EVSE when in-service, including whether an EVSE is in use or if it has faulted.

Table p2-18 : Operation state attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
OperState	This attribute gives the actual state of the associated object assuming the AdminState is in-service. If the associated object is unable to provide service because of some automatic fault handling, this will be indicated in OperState before the AdminState is reviewed and adjusted by the operator. If AdminState is not in-service, then the OperState should indicate “offline”. Unlike AdminState, OperState is not declared or set by the operator, but is a result of telemetry data.	1	See Table below
EventTime	Time of transition to the indicated state.	0..1	ISO 8601 UTC Time. Time zone offset must be specified.

The definitions for the OperState are as follows:

Unspecified	The operator has not provided (or does not want to provide) the state of the object.
Available	No car connected to EVSE, ready to charge
Charging	A charging session is still open (a car is connected)
Faulted	A car is connected and an error has occured during charge (this status appeared while charging)
Unavailable	No car is connected but the pole is not ready to charge
Offline	The platform has lost connection with the pole (may be used by customer depending on its ability to handle offline mode)
Reserved	No car is connected but no car can connect except the one that has booked this EVSE
Other	Private internal use. The state is different than any enumerated value given in this table.
Unknown	The operator is unable to ascertain the status of the EVSE because of a technical or other issue.

2.2.4 ServicePlan

Table p2-19 : Service plan attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
Title	A title or short name of the service plan.	1..n	Text: multi-lingual, short
Description	A longer textual description of the service plan or contract id for human consumption.	1..n	Text: multi-lingual, long
EVSPName	The name of the business entity responsible for defining and offering the service plan or contract.	1..n	Text: multi-lingual, short

2.2.5 UserComments

Table p2-20 : Usercomment attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
Source	The identity of the EVSP that received the comment from one of its customers, and is providing the comment for other parties to see.	1	Global Service provider ID as defined in section 1.4
Submitter	The submitter of the comment typically as a user handle within the namespace of the EVSP (see "Source" attribute). This string format is specific to the EVSP.	0..1	Text: multi-lingual, short
DateTime	Date and time when comment was submitted by the EVSP's customer.	1	ISO 8601 UTC Time. Time zone offset must be specified.
Comment	A text string with a language qualifier attribute. A single comment may be presented in multiple languages.	1..n	Text: multi-lingual, short

2.2.6 ParkingInfo

Table p2-21 : parkinginfo attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
SpotId	A globally unique identifier for the parking spot	1	Alphanumeric
SpotStatus	The availability status for the parking spot	0..1	1 : free, 2 : occupied, 3 : reserved, 4 : not accessible
SpotLabel	This attribute should reflect the identification label displayed on the parking spot. This string should be the same as what is visible to a customer. A label is a human consumable piece of information. The purpose of this element is for web and mobile-apps to be able to display a label that can be used to match up against the parking spot when finding one among many in the same vicinity. Example: "-2, 203", "A" may be painted on the parking spot wall or floor. Only a single label	0..1	Text: short
SpotDescription	A textual description of the parking spot.	0..n	Text: multi-lingual, long
OpenHours	The weekdays and times-of-day when the pool of charges can be accessed by public users. This time structure relates to the accessibility of the parking spaces near the pool of EV chargers.	0..1	OpenHours complex type
UseRestrictions	Indicates possible use restrictions associated with the parking spot:	0..1	1 : EV only, 2 : must be plugged in, 3 :diasbled person only; 4 : commercial vehicles

2.2.7 NameValuePair

Table p2-22 : Namevaluepair attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
Namespace	A globally unique identifier of the organization that defined this name-value pair. To prevent conflicting use of the same name with different definitions, the namespace of the defining organization must be included with each name-value pair (e.g., possibly as an independent XML element or as an attribute similar in nature to xlmns).	1	Global Spot Operator ID as deinfed in section 1.4
Name	Name of the attribute.	1	Text: short
Value	Value associated with the attribute.	1..n	Text: multi-lingual, long

2.2.8 Authorization Method Table

The table below lists the methods and token types accepted at the charging station to a.) pay for or b.) obtain authorization so that EV charging services can be provided. A charging station may accept multiple forms of payment and may also accept multiple types of tokens. When multiple authorizations methods are accepted at the charging station, an unordered list of white space separated identification strings shown in the column labelled “Identifier” shall be used as the encoded transmission method. For example, a valid unordered list of authorization methods can resemble “RFID-MIFARE Phone-App 15118-PLC Phone”. The identifiers are case sensitive and shall match the table below.

Note that conflicts are permissible. That is, a charging station may offer free charging for some services, while require authorization or payment for other services.

Table p2-23 : Authorization Method Values

Authorization Method	Identifier	Specifications / Description
Free charge	Free	Unlimited access
Private	Private	ex. : some autolib poles of a pool are private
Charge with EVSP Contract	RFID-MIFARE	RFID Card / Phone NFC - Mifare Classic
	RFID-DESFIRE	RFID Card / Phone NFC - Mifare Desfire
	RFID-Calypso	RFID Calypso
	PINPad	PINPAD
	Phone-App	Apps
	Phone-NFC	Phone (active RFID chip)
	15118-PLC	15118 - PLC
	15118-OTA	15118 - over the air
Charge without Contract	Phone	Phone (dialog with platform)
	Phone-SMS	Phone (SMS)
	Credit-Card	Credit card
	Money	local currency coin
	Pre-Paid	Pre-Paid card

2.2.9 UserInterfaceFeatures

Table p2-24 : UserInterfaceFeature attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
PinPadPresent	A PIN/key pad is present on the charging station	0..1	boolean: "true" or "false"
FeatureScreenPresent	A screen is present on the charging station.	0..1	boolean: "true" or "false"
LanguagesSupported	The language(s) supported by the user-interface of the EV charging stations.	0..n	IETF BCP-47 scheme (ISO 639 language codes+ ISO 3166 Country codes): ex. en-US, en-GB, fr-FR, fr-CA

2.2.10 OpenHours

Table p2-25 : Openhour attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT	EXAMPLE
AnnualClosings	Information about annual closing dates	0..n	Complex type comprising of FromDate and ToDate	
FromDate	Start date of the closing period (inclusively defined).	1	ISO 8601 : yyyy-mm-dd	2012-12-25
ToDate	End date of the closing period (inclusively defined).	1	ISO 8601 : yyyy-mm-dd	2012-12-31
RegularOpenings	Information about regular opening hours	0..n	Complex type comprising of Days and OpenHours	
Days	List of days for regular openings	0..n	WeekdayType	Monday Wednesday Thursday
OpenHours	List of hours for regular openings	0..n	Complex type comprising of OpenTime and ClosingTime	
OpenTime	Start time of opening hour	1	Time UTC	7:00:00
ClosingTime	End time of opening hour	1	Time UTC	18:00:00
AnnualOpenings	Information about annual opening hours	0..n	Complex type comprising of Days and OpenHours	
Days	List of days for regular openings	0..n	WeekdayType	Monday Wednesday Thursday
OpenHours	List of hours for regular openings	0..n	Complex type comprising of OpenTime and ClosingTime	
OpenTime	Start time of opening hour	1	Time UTC	7:00:00
ClosingTime	End time of opening hour	1	Time UTC	7:00:00

2.3 EVSE Attributes

Table p2-26 : EVSE attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
EVSEID		1	See chapter 1.3.2.1.
AdministrativeState	Administrative state of the EVSE.		"AdministrativeState" complex type
OperationalState	Operational state of the EVSE.	0..1	"OperationalState" complex type
ChargingMode	Charging mode according to IEC-61851 terminology	1..n	Enumerated string according to IEC-61851 charging modes: Mode1-AC-1p; Mode1-AC-3p; Mode2-AC-1p; Mode2-AC-3p, Mode3-AC-3p; Mode4-DC; Legacy-Inductive
NumPhases	Alternative single/3 phases or direct		text "AC - single phase" or "AC - three phases" or "DC"
RatedPowerLevel	The rated power level the EVSE is capable of delivering under normal operation conditions.	0..1	in W
VoltageRating	The rated voltage at which the EVSE operates at under normal operating conditions.	0..1	in V
PoDId	Point of Delivery of this EVSE. This is the identifier assigned by the DSO for the point of connection of the EVSE to the electrical grid. This value may be used to identify the electricity service to an EVSE. This information is used by SmartCharging.	0..1	alpha/digits
EnergyMeterId	The identifier for either main and sub-meters as assigned by the EVSE operator. The identifier for the energy meter may be the same as the PoDId.	0..1	Identifier string w/o white space
OtherAttributes	Name value pair strings can hold extension attributes that have not yet been standardized or custom information for operator use.	0..n	"NameValuePair" complex type

2.4 Connector / Socket-Outlet Attributes

Table p2-27 : Connector/ socket-outlet attribute description

ATTRIBUTE	DEFINITION	INST.	FORMAT
Label	This attribute should reflect the identification label displayed on a socket outlet. This string should be the same as what is visible to a customer. The purpose of this element is for web and mobile-apps to be able to display a label that can be used to match up against the socket outlet when finding one among many in the same vicinity. A label is a human consumable piece of information.	0..1	Canonical text
NumPhases	Alternative 1-phase, 3-phase, or DC implemented at the socket-outlet.	1	"AC - single phase" or "AC - three phases" or "DC"
RatedVoltage	The rated voltage at which the socket outlet operates at under normal operating conditions.	0..1	in V
RatedPowerLevel	The rated power level for the socket outlet under normal operation conditions.	1	in W
RealTimePower	Current power delivered or able to be delivered	0..1	in W
GuaranteedMinimumPower	In case of power management at pole level, EVSE Operator may commit to a minimum charging power	0..1	in W
CableAttached	Attached cable or floating	1	"floating" or "attached"
CableLength	in mm to avoid comma, conversion made by user of this data	0..1	mm
TypeOfPlug	type 2, type 3C ….	1	Seechapter 2.4.1
OtherAttributes	Name value pair strings can hold extension attributes that have not yet been standardized or custom information for operator use.	0..n	"NameValuePair" complex type

2.4.1 Type of Plug Table

Table p2-28 : Type of plug value table

Value	Specifications / Description	Standard (for precision)
DOMESTIC-A	**Standard/Domestic household, type "A"** 	
DOMESTIC-B	**Standard/Domestic household, type "B"** 	
DOMESTIC-C	**Standard/Domestic household, type "C"** 	
DOMESTIC-D	**Standard/Domestic household, type "D"** 	
DOMESTIC-E	**Standard/Domestic household, type "E"** 	
DOMESTIC-F	**Standard/Domestic household, type "F"** 	
DOMESTIC-E-F	**Standard/Domestic household, type "E+F"**	
DOMESTIC-G	**Standard/Domestic household, type "G"** 	
DOMESTIC-H	**Standard/Domestic household, type "H"** 	
DOMESTIC-I	**Standard/Domestic household, type "I"** 	
DOMESTIC-J	**Standard/Domestic household, type "J"** 	
DOMESTIC-K	**Standard/Domestic household, type "K"** 	
DOMESTIC-L	**Standard/Domestic household, type "L"** 	
DOMESTIC-M	**Standard/Domestic household, type "M"** 	

Value	Specifications / Description	Standard (for precision)	Combination with cable attached
IEC-62196-T2-F-NOCABLE	**Mennekes type 2 (IEC 62196 Typ 2) socket**	**IEC 62196 Type 2**	socket or attached
IEC-62196-T2-F-CABLE	**Mennekes type 2 (IEC 62196 Typ 2) cable attached**	**IEC 62196 Type 2**	socket or attached
IEC-62196-T3C-F-NOCABLE	**Type 3C**	**IEC 62196 Type 3**	socket
IEC-62196-T1-M-CABLE	**Type 1, attached cable**	**SAE J1772-2009/IEC 62196-2**	
IEC-62196-T1-F-NOCABLE	**Type 1 socket**	**SAE J1772-2009/IEC 62196-2**	cable attached
IEC-309-2-1PH	**IEC 309-2 single phase (IEC 60 309-2)**	**IEC 60 309-2**	socket
IEC-309-2-3PH	**IEC 309-2 three phases (IEC 60 309-2)**	**IEC 60 309-2**	Socket
CHADEMO	**CHAdeMO**		cable attached
IEC-62196-T3A-F	**Type 3A (= SCAME)** 		Socket
NEMA-5-20	**NEMA** 5-20 		Socket
TESLA-SPECIFIC	**Tesla** Connector 		cable attached
AVCON	**AVCON** Connector (compatible with SAE J1772 as November 2001) 	(compatible with SAE J1772 as November 2001)	cable attached
LARGE-PADDLE	**Large Paddle Inductive**		cable attached
SMALL-PADDLE	**Small Paddle Inductive**		cable attached
IEC-62196-T2-COMBO	**Combo type 2 based** 		cable attached
IEC-62196-T1-COMBO	**Combo type 1 based** 		cable attached
CHINA-PART2	**China GB part 2** 		socket or attached
CHINA-PART3	**China GB part 3** 		socket or attached
BPLC-SPECIFIC	**Better place socket**		socket
MARECHAL	**Marechal socket**		socket
IEC-309-2-DC	**IEC 309-2 DC plug**		socket

3 Charge Detail Record

The Charge Detail Record (CDR) is a set of data gathering all elements of a charging session (from customer identification, to pole identification, and charging information).

A charging session goes from customer identification on the pole to any end of session. End of session can come from customer disconnecting the cable or swiping is card to stop, stopping by another mean on the pole or an end session decided by pole or management session.

This CDR is sent by EVSE OP to EVSP (via market places or directly).

The CDR contains 2 parts:

- an identification part to identify the object, the service provider and the pole operator to allow clearing
- one or several charging periods.

The encoding of the data in IT systems SHALL be UTF-8 (cf. ISO/IEC 10646-1:2000, RFC 3629).

3.1 Charging Period

The initialization and end of a CDR is the responsibility of the Charging pole operator.

In between, each period is defined by the charging pole operator. There are at least 4 period types:

- connected and charging
- connected and discharging
- connected and not charging (an EV can stop charge for several reason such as battery cooling, charge complete, waiting to precool the cabin, waiting for night price ....)
- connected but EVSE is in a fault state

The energy is counted in Wh in order to avoid comma transcription problems

3.2 CDR Description

The table below describe the set of information composing a CDR. The CDR is made of :

- **a reference to the transaction**
- **charging details (timing, power ….)**

Table p2-29 : CDR attributes

Field	Format	Required	Comment
CDR_ID	**Charge Data Record number. Unique per EVSE Operator. It is made of a session ID AN36 (to allow unique random ID generation) + an Instance corresponding to the current step in the CDR transmission chain (00 from EVSE Op, 01 from frist market place, 02 from 2nd market place) structure : AN36.xx digit**	**M**	**To be used a reference. The combination CDR_ID and EVSE_ID identifies any CDR record.**
EVSE_ID	**EVSE ID as defined in eMI3 Business Objects**	**M**	**EVSE ID contains charging pole operator ID**
EMA_ID	**EMA ID as defined in eMI3 Business Objects**	**M/O**	**In RFID case, Token Id is known but EMA may not in Apps, EMA ID is known but Token may not At least one is mandatory**
Token-ID	**Token ID as defined in eMI3 Business Objects**	**O/M**	
Meter_ID or POD-ID	**AN40**	**O**	**Meter(serial)number**
Type of charge	**Type of charging power : 3 values DC, AC single phase, AC 3 phasis**	**O**	
Global begin session	**= Charging period 1 - Start_datetime**	**O**	**Format is according to ISO8601 UTC+Offset [YYYY]-[MM]-[DD]T[hh]:[mm]:[ss]±[hh]:[mm]**
Global end session	**= Charging period N - End_datetime**	**O**	**Format is according to ISO8601 UTC+Offset [YYYY]-[MM]-[DD]T[hh]:[mm]:[ss]±[hh]:[mm]**
Total Energy	**The quantity of energy delivered during the whole charge session in Wh.**	**O**	**Example: "4000"**
Global Transaction Cost after tax	**6 digits : xxxx.yy**	**O**	
Currency	**iso 4217 code**	**O**	**EUR, USD, JPY…..**
Charging period 1	**see details after**	**M**	
Charging period 2	**see details after**	**O**	
……		**O**	
Charging period N	**see details after**	**O**	

M means Mandatory / O means Optional

3.3 Details of a Charging Period:

The table below describe the content of a charging period presented in section above. It details the set of information required to describe all or part of a charging session.

Table p2-30 : charging period description

Field		Format	Required	Comment
Charging period X	**Start_datetime**	Start date and time of the charging period(event to be decided by charging pole operator (log on with badge or plug in …) Format is according to ISO8601 UTC+Offset [YYYY]-[MM]-[DD]T[hh]:[mm]:[ss]±[hh]:[mm]	O	Example: "2011-06-01T11:45:30+02:00"
	End_datetime	End of the first charging period (triggering event shall be decided by charging pole operator, for instance charging power going down to 0kW Format is according to ISO8601 UTC+Offset [YYYY]-[MM]-[DD]T[hh]:[mm]:[ss]±[hh]:[mm]	O	Example: "2011-06-01T11:45:30+02:00"
	Type	Fixed values : "occupied" / "charging" / "discharging" take into consideration aprking without charging	O	
	Max power allowed	Maximum power allowed by the charging station : XX kW	O	Example : 22 (no comma)
	Duration	Duration of the charge session [hh]:[mm]:[ss]	O	Example: "0:00:28"
	Energy	The quantity of energy delivered during the charge session in Wh.	O	Example: "4000"
	Detailed cost	Complex attribute made of cost (energy cost, parking cost, service fee ….) + tax + unit : Cost : 6 digits : xxxx.yy Unit : iso 4217 code	O	Example : “10.00 EUR”

M means Mandatory / O means Optional

Annex 1 Checksum Calculation (informative)

A description of the checksum calculation can be found at http://www.ochp.eu/id-validator/

There are also reference implementations available.