Electric Mobility — Schemes of Identifiers for E-Roaming — Contract ID and Electric Vehicle Supply Equipment ID

I. Inhalt

II. Foreword

This document aims to be the base for further international standardization of identification schemes in order to allow for a user-friendly and efficient transnational electric mobility experience.

We thank all the participants of the “Fachgruppe Interoperabilität” within the accompanying research of the research program “Information and Communication Technology for Electric Mobility” for their valuable input.

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III. Introduction

A number of research projects with focus on information and communication technology (ICT) for electric mobility revealed the need for inter-organizationally standardized identifiers of selected entities around an electrically motorized individual traffic (E-Mobility). In particular, the charging and discharging of Electric Vehicles (EV) at an Electric Vehicle Supply Equipment (EVSE) within an existing contract requires a fundamental set of identifiers that are guaranteed to be unique beyond organizational borders.

Considering two main communication scenarios in relation with EVSE (cf. Annex A.1), the unique identification of the following entities is required or useful for efficient inter-organizational E-Roaming processes: E-Mobility Operator, EVSE Operator, Contract and EVSE.

In order to guarantee the uniqueness of these identifiers, a central issuing authority and coordinated assigning process is needed. However, these issues are not addressed in this document.

IV. Scope

This document defines schemes that allow deriving identifiers for objects in the area of E-Mobility. The schemes can be used at human machine interfaces as well as for pure machine-to-machine communication. The schemes aim to be used within communication as defined by standards such as the currently developed ISO/IEC 15118.

Two schemes are defined: Identifiers derived from the first scheme identify the contract between an E-Mobility Operator and its customer. Identifiers derived from the second scheme identify an EVSE of an EVSE Operator.

V. Normative references

This document incorporates dated or undated references to other publications. These normative references are cited at the appropriate places in the text and the publications are listed in the following. For dated references, subsequent amendments to or revisions of any of these publications apply to this document only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

DIN EN ISO 3166-1:2006 : *Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes (Alpha-2-Code)*

ITU-T E.164:11/2010 : *Series E: Overall Network Operation, Telephone Service, Service Operation and Human Factors : International operation – Numbering plan of the international telephone service*

ISO/IEC 6523-1:1998 : *Information technology -- Structure for the identification of organizations and organization parts -- Part 1: Identification of organization identification schemes; Part 2: Registration of organization identification schemes*

ISO/IEC 10646-1:2000 : *Universal Multiple-Octet Coded Character Set (UCS) -- Part 1: Architecture and Basic Multilingual Plane, Annex D (UTF-8)*

ISO/IEC 15118-1, 2. Committee Draft: *Road vehicles — Vehicle to grid communication interface — Part 1: General information and use-case definition*

ISOC RFC 2141: 1997: *URN Syntax*

ISOC RFC 2169: 1997: *A Trivial Convention for using HTTP in URN Resolution*

ISOC RFC 2483: 1999: *URI Resolution Services Necessary for URN Resolution*

ISOC RFC 3401: 2002: *Dynamic Delegation Discovery System (DDDS)*

ISOC RFC 3406: 2002 : *Uniform Resource Names (URN) Namespace Definition Mechanisms*

ISOC RFC 3629: 2003 : *UTF-8, a transformation format of ISO 10646*

ISOC RFC 3986:2005 : *Uniform Resource Identifier (URI): Generic Syntax*

ISOC RFC 5234:2008 : *Augmented BNF for Syntax Specifications: ABNF*

VI. Terms and definitions

The terms and definitions in this document correspond to the definitions in ISO/IEC 15118-1, 2. Committee Draft. These terms and definitions as well as additional ones are used in the following sense:

3.1
Contract ID (EVCOID)
unique identifier of a contract that is used to enable charging and related services (incl. billing)

3.2
E-Roaming
charging or discharging of Electric Vehicles (EV) at an Electric Vehicle Supply Equipment (EVSE) via an existing contract between an E-Mobility Operator that is not the EVSE Operator of this EVSE

3.3
E-Mobility
electrically propelled road traffic

3.4
E-Mobility Operator
legal entity that the customer has a contract with for all services related to the EV in front of EVSE
NOTE: the customer can also be an EV(-fleet) operator that has own end customers. Services other than energy supply are possible.

3.5
Electric Vehicle (EV)
any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle such as a residential or public electric service), which is manufactured primarily for use on public streets, roads or highways

3.6
Electric Vehicle Supply Equipment (EVSE)
conductors, including the phase(s), neutral and protective earth conductors, the EV couplers, attached plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the EV and allowing communication between them as necessary
NOTE 1 For this purpose the EVSE may also include communication to secondary actors.
NOTE 2 For systems with multiple charge outlets, communication described in this standard may apply for each charge-outlet

3.7
Electric Vehicle Supply Equipment ID (EVSEID)
unique identifier of an EVSE, consisting at least of Spot Operator ID and Power Outlet ID

3.8
EVSE Operator
operates an EVSE; synonym to “Spot Operator”

3.9
Identifier (ID)
a sequence of characters embodying the information required to distinguish what is being identified from all other things within its scope of identification (cf. RFC 3986)

3.10
Power Outlet ID
unique identifier of a power outlet to the vehicle

3.11
Provider ID
unique identifier of an E-Mobility Operator

3.12
Spot Operator ID
unique identifier of an EVSE operator

VII. Abbreviations

AAA	Authentication, Authorization and Accounting
ABNF	Augmented Backus-Naur Form
E-Mobility	Electric Mobility
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EVCOID	Electric Vehicle Contract Identifier
EVSEID	Electric Vehicle Supply Equipment Identifier
GLN	Global Location Number
HTTP	Hypertext Transfer Protocol
ICD	International Code Designator
ICT	Information and Communication Technology
ID	Identifier
UTF	UCS (Universal Character Set / Unicode) Transformation Format
URN	Uniform Resource Name
RDF	Resource Description Framework

VIII. Specifications of identifiers

1. Recommendations

The identifiers could be persistent during the life of the identified entity.

Note: Since these IDs could 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 should never be communicated together with the identifier.

The choice of identifiers by E-Mobility Operator or EVSE Operator must not directly reveal confidential information about Contracts and EVSE to third parties.

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

2. EVCOID Specification

EVCOID Syntax

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

<EVCOID> = <Country Code> <S> <Provider ID> <S> <Instance> <S> <Check Digit>

with

<Country Code> 2 ALPHA ; two character country code according to DIN EN ISO-3166-1 (Alpha-2-Code)

<Provider ID> = 3 (ALPHA / DIGIT) ; three alphanumeric characters

<Instance> = 6 (ALPHA / DIGIT) ; six alphanumeric characters

<Check Digit> = 1 DIGIT ; see section 0 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 EVCOID therefore is “DE8AA123A563”.

EVCOID Semantics

The <EVCOID> must be interpreted case insensitive, i.e. “DE8AA123A563” is exactly the same ID as “De8aa123A563”.

A star (“*“) or hyphen (“-“) can be used between the elements <country code>, <organization>, <instance> and <check number> 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*123A56*3”. If the illustration with stars is chosen, stars must be set at all three (3) spaces.

Each <EVCOID> has a fixed length of twelve characters excluding the optional stars or fifteen characters including the optional separators.

While the <Provider ID> must be assigned by a central issuing authority, each provider with an assigned <Provider ID> can chose the <Instance> within the above mentioned rules freely.

Calculation of the check digit

A unique value is determined for each of the first 11 character of the <EVCOID>. While the numbers (DIGIT) keep their value, the letters (ALPHA) are mapped to values from A=10 to Z=35.

NOTE: Intermediate stars are not considered. The mapping is case insensitive, i.e. “D” as well as “d” maps to the value 13.

In the resulting <value string>, each digit is multiplied with the weight $2^{<pos>}$ (“2 to the power of <pos>”) where <pos> represents the position of the digit in the <value string> and <pos> starts with number zero. The resulting products are summed up to <checksum>.

Note: There are at least 11 (if only numbers are used in the <EVCOID>) and at most 22 (if only letters are used in the <EVCOID>) resulting products.

Finally, <checksum> is taken “modulo 11”. The result of this modulo-computation is a number between “0” and “10”. The numbers between “0” and “9” are taken as <Check Number>, the <Check Number> for “10” is the letter “X”.

NOTE: Check digits based on the modulo-11 principle are able to identify single typing errors as well as singled transposed characters.

Example: Mapping the 11 characters “DEA2ZG8L16P” to values results in the <value string> “131410235168211625” and consequently to the <checksum> “1040699”. The modulo-11 computation results to the <Check Digit> “0” and the <EVCOID> “DEA2ZG8L16P0”.

3. EVSEID Specification

EVSEID Syntax

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

<EVSEID> = <Country Code> “*” <Spot Operator ID> “*” <Power Outlet ID>

with

<Country Code> = 1 * 3 DIGIT ; up to three digits according to country code for geographic areas in ITU-T E.164:11/2010

<Spot Operator ID> = 3 * 6 DIGIT ; between three and six digits

<Power Outlet ID> = 1 * 32 ((1 * DIGIT) ["*"]) ; sequence of digits and stars

DIGIT = %x30-39 ; according to RFC 4234(7-Bit ASCII)

An example for a valid EVSEID is "+49*123*456*789" with "+49" indicating Germany, "123" representing a particular Spot Operator and "456*789" representing one of its power outlets.

NOTE: In contrast to the EVCOID, no check digit is specified for the EVSEID in this document (cf. Annex A.2).

EVSEID Semantics

Each <EVSEID> has a variable length with at least five characters (one digit <Country Code>, three digits <Spot Operator ID>, one digit <Power Outlet ID>) and at most forty-one characters (three digits <Country Code>, six digits <Spot Operator ID>, thirty-two digits <Power Outlet ID>).

While the <Spot Operator ID> must be assigned by a central issuing authority, each operator with an assigned <Spot Operator ID> can chose the <Power Outlet ID> within the above mentioned rules freely.

4. Usage of Identifiers in IT Systems

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

The encoding of the identifiers in IT systems should be UTF-8 (cf. ISO/IEC 10646-1:2000).

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

IX. Informative Annex

1. Need for unique identification

Currently, two communication scenarios are targeted in context with authentication, authorization and accounting (AAA) of EV at EVSE (cf. **Figure 1**).

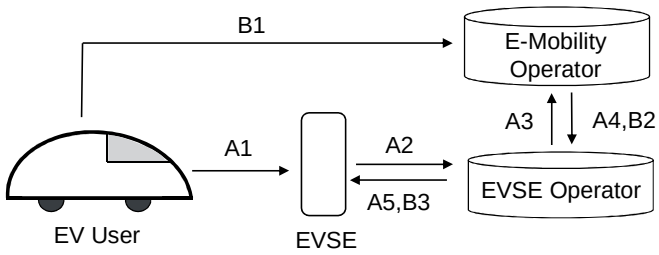

Figure 1: Communication scenarios with possible steps of data exchange for AAA

In scenario A, the EV User (or its EV on behalf of him) passes all information needed for AAA through the EVSE (A1) to the EVSE Operator (A2). The EVSE Operator forwards the information to the E-Mobility Operator and requests AAA for the EV User (A3). If the response (A4) is positive, the EVSE Operator unlocks the EVSE for charging (A5). In scenario B, the EV User directly connects to the E-Mobility Operator (B1) and

requests AAA for a particular EVSE. If successful, the E-Mobility Operator requests the EVSE Operator (B2) to unlock remotely the particular EVSE for charging (B3).

In relation to these communication scenarios, **Figure 2** reveals that identifying the E-Mobility Operator and EVSE Operator inter-organizationally (each in one of communication scenarios) is indispensable.

Identifiers	Scenario A	Scenario B
E-Mobility Operator	Required *EVSE Operator needs to know which E-Mobility Operator to contact for AAA*	Optional *E-Mobility Operator could always be identified by the EVSE Operator due to AAA-Request*
EV User (via Contract)	Optional *Proprietary ID for EV / User could always be identified by the issuing E-Mobility Operator*	Optional *Proprietary ID for EV / User could always be identified by the issuing E-Mobility Operator*
EVSE	Optional *Proprietary ID for EVSE could always be identified by the issuing EVSE Operator*	Optional *Proprietary ID for EVSE could always be identified by the issuing EVSE Operator*
EVSE Operator	Optional *EVSE Operator could always be identified by the E-Mobility Operator due to AAA-Request*	Required *E-Mobility Operator needs to know which EVSE Operator to contact for AAA*

Figure 2: Need for uniqueness of identifiers

Nevertheless, the inter-organizationally standardized identification of contracts between an EV User and its E-Mobility Operator or of the EVSE of an EVSE Operators is desirable due to efficiency and end customer usability.

2. Motivation for the check digit in the EVCOID

Check digits are used to identify misspellings and errors of IDs due to wrong manual input or transmission at an early stage in the authentication process. Hence, a check digit is specified as part of the EVCOID (cf. 5.2). For the EVSEID, no check digit(s) are specified in this document. It is up to the spot operator to include check digit(s) as part of the <Power Outlet ID>. Check digit(s) for the EVSEID need not to be standardized as the principle of access requests implies that there is a live communication link in the back-end. This back-end communication link enables the validation of EVSEIDs for the access request between the E-Mobility Operator and the EVSE Operator (cf. Annex A.1).

3. Future use within Uniform Resource Name (URN)

All Uniform Resource Names (URNs) have the following syntax (cf. RFC 2141, here adapted to ABNF):

<URN> = "urn:" <NID> ":" <NSS>

where <NID> is the Namespace Identifier, and <NSS> is the Namespace Specific String. The namespace is managed via IANA and IETF (cf. RFC 3406). Henceforth, an integration of the identification schemes via <NID> = “EVCOID” or <NID> = “EVSEID” would be possible in the future.

4. Resolving EVCOIDs and EVSEIDs

There must be a procedure for resolving EVCOIDs and EVSEIDs. Identifier resolution can be provided via a look-up against a local database or via a network-accessible service that associates the ID with its corresponding resource.

The resolution process should provide structured, self-describing metadata describing the entity associated with a particular ID to allow for advanced services and to foster machine-to-machine communication. ID metadata should be encoded in a structured and self-describing manner, thereby allowing the requestor to process the data without a priori knowledge of data schema or data semantics. One possible data encoding satisfying above requirements is the Resource Description Framework (RDF).