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Edition 1.0 2016-04

TECHNICAL REPORT

colour inside

Communication networks and systems for power utility automation – Part 90-8: Object model for E-mobility



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Communication networks and systems for power utility automation – Part 90-8: Object model for E-mobility

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-8: Object model for E-mobility

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IEC TR 61850-90-8, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
57/1603/DTR	57/1651/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61850 series, published under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This part of IEC 61850-90, which is a technical report, describes how current standardization for Electric Road Vehicles (EV) and the Vehicle-to-Grid Communication Interface can be linked to IEC 61850-7-420, which deals with Distributed Energy Resources (DER). This technical report provides necessary background information and proposes an object model for E-Mobility in order to establish an EV plugged into the power grid as DER according to the principles of IEC 61850-7-420. The basic information modeling in IEC 61850 and IEC 61850-7-420 already covers a lot of needs for the E-Mobility domain. Missing parts can be modeled as new logical nodes and data objects, which this technical report defines.

NOTE Editorial Notes on this technical report are summarized in Annex G.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-8: Object model for E-mobility

1 Scope

This part of IEC 61850-90, which is a technical report, shows how IEC 61850-7-420 can be used to model the essential parts of the E-Mobility standards related to Electric Vehicles and Electric Vehicle Supply Equipments (IEC 62196, IEC 61851, IEC 15118) and the Power system (IEC 61850-7-420), in order to secure a high level of safety and interoperability.

The namespace of this document is:

- “(TR) IEC 61850-90-8:2015”

The name space "IEC 61850-90-8" is considered as "Transitional" since the model is expected to be included in the next edition of IEC 61850-7-420 [1] . Potential extensions/modifications may happen if/when the model is given International Standard status. The most optimal backward compatibility with the original content will be strived for during this move.

In accordance with the status of the ISO 15118 series and systems determined in IEC 61851-23 and -24, this technical report focuses on EV charging processes only. Discharging processes in order to support grid services are out of scope, but will be adopted when available in future versions of ISO 15118-2 and IEC 61851-1, -23 and -24.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-7-420:2009, *Communication networks and systems for power utility automation – Part 7-420: Basic communication structure – Distributed energy resources logical nodes*

IEC 61851-1:2010, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 61851-21-1:−, *Electric vehicle conductive charging system – Part 21-1: Electric vehicle onboard charger EMC requirements for conductive connection to a.c./d.c. supply*[1]

IEC 61851-21-2:−, *Electric vehicle conductive charging system – Part 21-2: EMC requirements for OFF board electric vehicle charging systems*[1]

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1 To be published.

IEC 61851-23:2014, *Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station*

IEC 61851-24:2014, *Electric vehicle conductive charging system – Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging*

IEC 62196-1:2014, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements*

IEC 62196-2:2011, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories*

IEC 62196-3:2014, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers*

ISO 15118-1:2013, *Road vehicles – Vehicle to grid communication interface – Part 1: General information and use-case definition*

ISO 15118-2:2014, *Road vehicles – Vehicle-to-grid communication interface – Part 2: Network and application protocol requirements*

ISO 15118-3:2015, *Road vehicles – Vehicle-to-grid communication interface communication interface – Part 3: Physical and data link layer requirements*

3 Terms, definitions and acronyms

For the purposes of this document, the following terms, definitions and acronyms apply.

3.1 Terms and definitions

3.1.1
Balance Responsible Party
BRP
party that has a contract proving financial security and identifying balance responsibility with the Imbalance Settlement Responsible of the Market Balance Area entitling the party to operate in the market

Note 1 to entry: This is the only role allowing a party to nominate energy on a wholesale level.

Note 2 to entry: The meaning of the word "balance" in this context signifies that that the quantity contracted to provide or to consume must be equal to the quantity really provided or consumed.

Note 3 to entry: This is equivalent to "Program responsible party" in the Netherlands, "Balance group manager" in Germany and "market agent" in Spain.

[SOURCE: ENTSO-E RM:2014-01]

3.1.2
CHArge de Move
CHAdeMO
Socket, connector and charging system for DC quick charging, equivalent to "move by charge"

3.1.3
Charging Infrastructure Operator
CIO
legal entity that operates and maintains the EVSE

Note 1 to entry: It is not obligatory that there is an operator for the EVSE, but e. g. in case of ID validation or Smart Charging where communication is needed, the responsible entity regarding the communication will be the E-Mobility Infrastructure Operator.

Note 2 to entry: This entry corresponds to the Charging Station Operator (CSO or CSIO) in the upcoming IEC TS 62913-2-4[2].

3.1.4
Charging Station
single or multiple EV Supply Equipment(s)

Note 1 to entry: See also EVSE.

3.1.5
Building Energy Management System
BEMS
providers, delivering the systems which facilitate management and control of building facilities, realizing energy saving and increasing comfortability of users of buildings and making full use of the state-of-the-art Information Technology.

[SOURCE: EG3 Deliverable:2011]

3.1.6
Demand Clearing House
DCH
entity for grid negotiation that provides information on the load of the grid

Note 1 to entry: The demand clearing house mediates between two clearing partners – a SECC and the part of the power grid connected to this SECC. Most likely this function will be served by a system operator.

Note 2 to entry: Demand Clearing House and meter operator may exchange information with each other as well as with other actors.

EXAMPLE A DCH typically fulfils following tasks:

- Collect all necessary information from all parts of the power grid, e.g. current or forecasted load of local transformers, distribution grid, power substation, transmission grid, transmission substation, power plants (incl. renewable energies), and predicted charging schedules submitted by EVCCs.A Charging Station represents a single or multiple EV Supply Equipment(s) (see also EVSE).
- Consolidate the collected grid information to a ―grid profile‖ and offer it to SECCs / EVCCs.
- Provide charging schedule proposal for the connected EV to the requesting SECC based on the collected grid profile.
- Inform the SECC as to the necessity for an updated charging schedule if the grid profile has changed.
- On the contrary, the SECC will inform the demand clearing house if the EV's charging schedule has changed.

[SOURCE: ISO 15118-1:2013]

3.1.7
digital communication
digitally encoded information exchanged between an EV charging station and an EV, as well as the method by which it is exchanged

Note 1 to entry:

- 1. CAN based using a dedicated data communication circuit; CAN protocol is given in ISO 11898-1; refer to IEC 61851-24:2014, Annex A and Annex B for specific implementation details;

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2 Under consideration.

- 2. Powerline Communication (Homeplug Green PHY TM) over the control pilot line; refer to IEC 61851-24:2014, Annex C for specific implementation details.

3.1.8
Distribution System Operator
DSO
natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity, according to Article 2.6 of the Directive

Note 1 to entry: Moreover, the DSO is responsible for regional grid access and grid stability, integration of renewables at the distribution level and regional load balancing.

[SOURCE: EG3 Deliverable:2011]

3.1.9
E-Mobility Clearing House
entity mediating between two clearing partners to provide validation services for roaming regarding contracts of different E-Mobility Service Providers

Note 1 to entry: The E-Mobility clearing house's purpose is to:

- collect all necessary contract information like Contract ID, E-Mobility Service Provider (EMSP), communication path to E-Mobility Service Provider, roaming fees, begin- and end-date of contract, etc.
- provide SECC with confirmation that an E-Mobility Service Provider (EMSP) will pay for a given Contract ID (authentication of valid contract) and transfer a corresponding Service Detail Record (SDR) after each charging session to the corresponding E-Mobility Service Provider (EMSP).

Note 2 to entry: E-Mobility Clearing House, E-Mobility Service Provider (EMSP) and Meter Operator (MO) may exchange information with each other as well as other actors.

3.1.10
E-Mobility Customer
legal entity being associated to an E-Mobility Service Provider

Note 1 to entry: The E-Mobility Customer may be bound to an E-Mobility Service Provider by the legal means of a contract.

3.1.11
E-Mobility Infrastructure Producer
legal entity that manufactures E-Mobility infrastructure components (e. g. EVSEs)

3.1.12
E-Mobility Infrastructure Owner
legal entity that owns E-Mobility infrastructure (e.g. EVSEs)

3.1.13
E-Mobility Service Provider
EMSP
legal entity that provides services to the Electric Vehicle User (EVU) related to the operation of an EV

Note 1 to entry: This definition is also considered in the upcoming IEC TS 62913-4[3].

[3] Under consideration.

3.1.14
Electric Energy Meter
EEM
equipment to measure electrical energy by integrating power with respect to time, which complies with IEC 62052-11 and IEC 62053-21, IEC 62053-52

Note 1 to entry: Some use cases need the amount of electric energy measured by the electric energy meter and communicated through the SECC to the EVCC, while other scenarios do not need a separate electric energy meter. The EV may get this information and use it according to the intentions of the OEM.

Note 2 to entry: The EEM may be operated by a Metering Operator.

[SOURCE: ISO 15118-1:2013]

3.1.15
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

[SOURCE: ISO 15118-1:2013]

3.1.16
Electric Vehicle Communication Controller
EVCC
embedded system, within the vehicle, that implements the communication between the vehicle and the SECC in order to support specific functions

Note 1 to entry: Such specific function could be e.g. controlling in- and output channels, encryption, or data transfer between vehicle and SECC.

[SOURCE: ISO 15118-1:2013]

3.1.17
Electric Vehicle Manufacturer
OEM
legal entity responsible for all the technologies inside the EV also in relation to the data communication

Note 1 to entry: This is commonly known as OEM (Original Equipment Manufacturer).

3.1.18
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 to entry: For the purposes of this document, it is assumed that an EVSE may host multiple outlets each being managed according to IEC 61851-1 Annex A.

[SOURCE: ISO 15118-1:2013]

3.1.19
Electric Vehicle User
EVU
person or legal entity using the vehicle and providing information about driving needs and consequently influences charging patterns

Note 1 to entry: Driving needs such as range and time of availability are necessary to achieve the most appropriate charging scenario.

Note 2 to entry: There shall be a relationship/association between the EVU and the E-Mobility Customer (EC). However, the exact nature of this relationship/association depends on the underlying business models and use cases.

[SOURCE: ISO 15118-1:2013]

3.1.20
Electricity Provider
EP
body of secondary actor to provide electricity

3.1.21
Energy Market
commodity markets that deal specifically with the trade and supply of energy (purchase and sale of energy products)

Note 1 to entry: Energy market may refer to an electricity market, but can also refer to other sources of energy.

Note 2 to entry: It typically describes a wholesale market for energy producers and energy retailers. Other participants in the wholesale energy market include financial intermediaries, energy traders and large consumers.

3.1.22
energy Supplier
retailer
entity that offers contracts for supply of energy to a consumer (the supply contract)

Note 1 to entry: Within this role the energy Supplier will initiate DSM activities.

Note 2 to entry: In some countries referred to as Retailer.

3.1.23
High Level Communication
HLC
bidirectional digital communication using protocol and messages specified in ISO 15118-2 and physical and data link layer specified in ISO 15118-3

Note 1 to entry: High-level communication in ISO 15118 is compliant to the term digital communication in SAE J1772/2836/2847/2931.

[SOURCE:ISO 15118-1:2013]

3.1.24
Meter Operator
MO
party responsible for installing, maintaining, testing, certifying and decommissioning physical meters

[SOURCE: ENTSO-E RM:2014-01]

3.1.25
Power Outlet
part of a plug and socket-outlet intended to be installed with the fixed wiring

Note 1 to entry: All power outlets shall have the pilot function.

[SOURCE: ISO 15118-1:2013]

3.1.26
Primary Actor
PA
role involved directly in the charging process

[SOURCE: ISO 15118-1:2013]

3.1.27
Secondary Actor
SA
role involved indirectly in the charging process

Note 1 to entry: Secondary actors may exchange information between each other.

Note 2 to entry: Secondary actors could also be a single entity.

[SOURCE: ISO 15118-1:2013]

3.1.28
Service Detail Record
SDR
data package of a charge or service related session with all necessary information that an E-Mobility Service Provider needs for billing or for informing the customer about the session

Note 1 to entry: Some data may be sent from EVSE. Some data originally be owned by E-Mobility Clearing House. Some data may be created at E-Mobility Clearing House. Some record to be sent to E-Mobility Service Provider for billing or informing their customers.

[SOURCE: ISO 15118-1:2013]

3.1.29
Supply Equipment Communication Controller
SECC
entity which implements the communication to one or multiple EVCCs according to ISO 15118-2 and which may be able to interact with secondary actors

Note 1 to entry: Further details regarding possible architectures are given in Annex A.

Note 2 to entry: Functions of a supply equipment communication controller could be controlling in- and output channels, encryption of data, or data transfer between vehicle and SECC.

[SOURCE: ISO 15118-1:2013]

3.1.30
System Operator
SO
party that is responsible for a stable power system operation (including the organisation of physical balance) through a transmission grid in a geographical area

Note 1 to entry: The System Operator will also determine and be responsible for cross border capacity and exchanges. If necessary he may reduce allocated capacity to ensure operational stability.

Note 2 to entry: Transmission as mentioned above means "the transport of electricity on the extra high or high voltage network with a view to its delivery to final customers or to distributors. Operation of transmission includes as well the tasks of system operation concerning its management of energy flows, reliability of the system and availability of all necessary system services." (Definition taken from the ENTSO-E RGCE Operation handbook Glossary).

Note 3 to entry: Additional obligations may be imposed through local market rules.

[SOURCE: ENTSO-E RM:2014-01]