DRAFT INTERNATIONAL STANDARD ISO/IEC DIS 15118-2

ISO/IEC TC **22/SC3**   Secretariat: **DIN**

Voting begins on   **Voting terminates on**
2012-05-18   **2012-10-18**

Road vehicles — Vehicle to grid communication interface —

Part 2:
Network and application protocol requirements

Véhicules routiers — Interface de communication entre véhicule et réseau électrique —
Partie 2: Exigences du protocole d'application et du réseau

ICS 43.120

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ISO/IEC DIS 15118-2

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15118-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronique equipment*.

ISO/IEC 15118 consists of the following parts, under the general title *Road vehicles — Vehicle-to-Grid Communication Interface*:

— *Part 1: General information and use-case definition*

— *Part 2: Network and application protocol requirements*

— *Part 3: Physical layer and Data Link layer requirements*

Introduction

The pending energy crisis and necessity to reduce greenhouse gas emissions has led the vehicle manufacturers to a very significant effort to reduce the energy consumption of their vehicles. They are presently developing vehicles partly or completed propelled by electric energy. Those vehicles will reduce the dependency on oil, improve the global energy efficiency and reduce the total CO_2 emissions for road transportation if the electricity is produced from renewable sources. To charge the batteries of such vehicles, specific charging infra-structure is required.

Much of the standardization work on dimensional and electrical specifications of the charging infrastructure and the vehicle interface is already treated in the relevant ISO or IEC groups. However the question of information transfer between the EV and the EVSE has not been treated sufficiently.

Such communication is necessary for the optimization of energy resources and energy production systems so that vehicles can recharge in the most economic or most energy efficient way. It is also required to develop efficient and convenient billing systems in order to cover the resulting micro-payments. The necessary communication channel may serve in the future to contribute to the stabilization of the electrical grid as well as to support additional information services required to operate electric vehicles efficiently and economically.

Road vehicles — Vehicle-to-Grid Communication Interface — Part 2: Network and application protocol requirements

1 Scope

This International Standard specifies the communication between battery electric vehicles (BEV) or plug-in hybrid electric vehicles (PHEV) and the Electric Vehicle Supply Equipment. The application layer message set defined in this Part of ISO/IEC 15118 is designed to support the energy transfer from an EVSE to an EV. Part 1 contains additional use case elements (Part 1 Use Case Element IDs: F4 and F5) describing the bidirectional energy transfer. The implementation of these use cases requires enhancements of the application layer message set defined herein. The definitions of these additional requirements will be subject of the next revision of this standard.

The purpose of this Part of ISO/IEC 15118 is to detail the communication between an EV (BEV or a PHEV) and an EVSE. Aspects are specified to detect a vehicle in a communication network and enable an Internet Protocol (IP) based communication between EVCC and SECC.

Key

1   Scope of this Part of ISO/IEC DIS 15118-2
2   Message definition considers use cases defined for communication between SECC to SA

Figure 1 — Communication relationship between EVCC SECC, and Secondary Actor

This part defines messages, data model, XML/EXI based data representation format, usage of V2GTP, TLS, TCP and IPv6. In addition the document describes how data link layer services can be accessed from a layer 3 perspective. The Data Link Layer and Physical Layer functionality is described in Part 3 of this standard.

2 Normative references

The following referenced documents are required for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

SAE J1772, *SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler*

IEC 62196, *Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles*

DIN 91286, *Electric mobility – Schemes of identifiers for E-Roaming – Contract ID and Electric Vehicle Supply Equipment ID*

W3C EXI 1.0, *Efficient XML Interchange (EXI) Format 1.0, W3C Recommendation (March 2011)*

IETF RFC 768, *User Datagram Protocol (August 1980)*

IETF RFC 793, *Transmission Control Protocol - DARPA Internet Program - Protocol Specification (September 1981)*

IETF RFC 1323, *TCP Extensions for High Performance (Mai 1992)*

IETF RFC 1624, *Computation of the Internet Checksum via Incremental Update (Mai 1994)*

IETF RFC 1981, *Path MTU Discovery for IP version 6 (August 1996)*

IETF RFC 2018, *TCP Selective Acknowledgment Options (October 1996)*

IETF RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification (December 1998)*

IETF RFC 2560, *X.509 Internet Public Key Infrastructure Online Certificate Status Protocol - OCSP (June 1999)*

IETF RFC 3122, *Extensions to IPv6 Neighbor Discovery for Inverse Discovery Specification (June 2001)*

IETF RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6) (July 2003)*

IETF RFC 3484, *Default Address Selection for Internet Protocol version 6 (IPv6) (February 2003)*

IETF RFC 3782, *The NewReno Modification to TCP's Fast Recovery Algorithm (April 2004)*

IETF RFC 4291, *IP Version 6 Addressing Architecture (February 2006)*

IETF RFC 4429, *Optimistic Duplicate Address Detection (DAD) for IPv6 (April 2006)*

IETF RFC 4443, *Internet Control Message Protocol (ICMP v6) for the Internet Protocol version 6 (IPv6) specification (March 2006)*

IETF RFC 4861, *Neighbor Discovery for IP version 6 (IPv6) (September 2007)*

IETF RFC 4862, *IPv6 Stateless Address Autoconfiguration (September 2007)*

IETF RFC 5095, *Deprecation of Type 0 Routing Headers in IPv6 (December 2007)*

IETF RFC 5116, *An Interface and Algorithms for Authenticated Encryption (January 2008)*

IETF RFC 5246, *The Transport Layer Security (TLS) Protocol Version 1.2 (August 2008)*

IETF RFC 5289, *TLS Elliptic Curve Cipher Suites with SHA-256/384 and AES Galois Counter Mode (GCM) (August 2008)*

IETF RFC 5482, *TCP User Timeout Option (March 2009)*

IETF RFC 5681, *TCP Congestion Control (September 2009)*

IETF RFC 5722, *Handling of Overlapping IPv6 Fragments (December 2009)*

IETF RFC 6066, *Transport Layer Security (TLS) Extensions: Extension Definitions (January 2011)*

IETF RFC 6106, *IPv6 Router Advertisement Options for DNS Configuration (November 2010)*

IETF RFC 6298, *Computing TCP's Retransmission Timer (June 2011)*

IETF RFC 6335*, Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transfer Protocol Port Number Registry (August 2011)*

IANA Service&PortRegistry, *Service Name and Transport Protocol Port Number Registry [viewed 2011-01-16], Available from: <http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xml>*

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply in addition to the terms and definitions given in Part 1.

3.1
Communication Setup Timer
A Timer monitoring the time from plug-in until the Session Setup message.

3.2
Contract Certificate
Certificate issued to EVCC either by V2G Root CA or by Sub CA, which is used in XML Signatures in application layer so that SECC or Secondary Actor can verify the Contract issued to the EVCC and signatures issued by the EVCC.

3.3
Credentials
anything that provides the basis for confidence, belief, credit, etc.

EXAMPLE   Examples include certificates, passwords, user names and so on.

3.4
DER/PEM
DER (Distinguished Encoding Rules = ASN-1 encoding rule) is a method for encoding a data object, such as an X.509 certificate, to be digitally signed or to have its signature verified. X.509 certificate files encode in DER are binary files, which can not be used with XML unless they are Base64 encoded. PEM (Privacy Enhanced Mail) Encoding (Base64 encoding) is a commonly used encoding schema for X.509 certificate files. The full specification of DER/PEM is in IETF RFC 1421.

3.5
Global address
IP address with unlimited scope

3.6
Link-local address
IP address with link-only scope that can be used to reach neighboring nodes attached to the same link

3.7
(IP)-Address
IP-layer identifier for an interface or a set of interfaces

3.8
Maximum Transfer Unit (MTU)
maximum size of the Data Link Layer that can be used for the IP Layer

3.9
Message Set
A set of mandatory V2G messages and parameters for the EVCC or SECC covering one or multiple use case elements

3.10
Message Timer
A Timer monitoring the exchange of a Request-Response-Pair.

3.11
Network segment
collection of devices that can exchange data on Data Link Layer level directly via Data Link Addresses

EXAMPLE   Ethernet: all devices which can see each other via MAC adresses.

3.12
node
a device that implements IPv6

3.13
Performance Time
A non-functional timing requirement defining the time a V2G Entity shall not exceed when executing or processing certain functionality. This is a fixed time value.

3.14
Profile
A group of mandatory and optional Message Sets covering a set of similar charging scenarios for a specific identification means.

3.15
Ready to Charge Timer
A Timer monitoring the time from plug-in until the first Power Delivery message.

3.16
Ready to Charge Time
A device or piece of software used in an implementation for measuring time. Depending on the specific use case a timer is used to trigger certain system events as well.

3.17
Request-Response Message Pair
A request message and the corresponding response message.

3.18
Request-Response Message Sequence
A Sequence of multiple Request-Response Message Pairs.

3.19
SDP Client
A V2G entity that uses the SDP server to get configuration information about the SECC to be able to access the SECC.

3.20
SDP Server
A V2G entity providing configuration information for accessing the SECC.

3.21
SECC Certificate
Certificate issued to SECC either by V2G Root CA or by Sub CA, which is used in TLS so that EVCC can verify the authenticity of EVCC.

3.22
Sequence Timer
A Timer monitoring a Request-Response Message Sequence

3.23
Sub-CA
Subordinate certificate authority who issues SECC certificates and/or Contract certificates on behalf of the V2G Root CA.

NOTE   The ability of issuing the certificates are delegated from V2G Root CA, and V2G Root CA can revoke the sub CA at any time.

3.24
Sub CA Certificate
Certificate issued to Sub CA.

3.25
TCP_DATA
Socket/interface for data transfer based on TCP conncetion

3.26
Timeout
A timing requirement defining the time a V2G Entity monitors the communication system for a certain event to occur. If the specified time is exceeded the respective V2G Entity initiates the related error handling. This is a fixed time value.

3.27
Timer
A device or piece of software used in an implementation for measuring time. Depending on the specific use case a timer is used to trigger certain system events as well.

3.28
Trusted Environment
Closed user group (e. g. members of car sharing system) with some pre-distributed token for access to the SECC charging service (e.g. key to home garage, RFID token for car sharing). Trusted environment is something where a person or instance is responsible for. Responsibility lies for example (not limited to) at a person with its home garage, a car sharing operator or a taxi operator.

3.29
V2G Communication Session
association of two specific V2G entities for exchanging V2G messages

3.30
V2G Entity
primary actor participating in the V2G communication using a mandatory or optional transmission protocol defined by this part of ISO/IEC 15118.

3.31
V2G Message
message exchanged on application layer (refer to clause 8 Application Layer messages)

3.32
V2GTP Entity
V2G entity supporting the V2G Transfer Protocol

3.33
V2GTP Root CA
Certificate Authority (CA) who issues Contract Certificates and/or SECC Certificates, or who delegates ability to issue such Certificates to Sub CA.

4   Symbols and abbreviated terms

For the purposes of this document, the following abbreviations apply:

BEV   Battery Electric Vehicle

CA   Certificate Authority

CRL	Certificate Revocation List
DH	Diffie Hellman
DER	Distinguished Encoding Rules
ECDSA	Elliptic Curve Digital Signature Algorithm
EV	Electric Vehicle
EVCC	Electric Vehicle Communication Controller
EVSE	Electric Vehicle Supply Equipment
EXI	Efficient XML Interchange
OCSP	Online Certificate Status Protocol
OEM	Original Equipment Manufacturer
NACK	Negative Acknowledgement
PDU	Protocol Data Unit
PEM	Privacy Enhanced Mail
PHEV	Plug-in Hybrid Vehicle
PKI	Public Key Infrastructure
PLC	Power Line Communication
PnC	Plug and Charge
SA	Secondary Actor
SAML	Security Assertions Markup Language
SDP	SECC Discovery Protocol
SDU	Service Data Unit
SECC	Supply Equipment Communication Controller
TCP	Transmission Control Protocol
V2G	Vehicle to Grid Communication
V2G CI	Vehicle-to-Grid Communication Interface
V2GTP	V2G Transfer Protocol
V2GTPPT_EXI	V2G Transfer Protocol Payload Type for EXI messages
UDP	User Datagram Protocol
UML	Unified Modeling Language
XML	Extensible Markup Language

5   Conventions

5.1 Definition of OSI based services

ISO/IEC°15118-2 is based on the conventions discussed in the OSI Service Conventions (refer to ISO 10731) as they apply for the individual layers specified in this document.

This part of ISO/IEC°15118-2 describes requirements applicable to layer 3-7 according to the OSI layered architecture.

5.2 Requirement structure

This document uses a requirement structure i.e. a unique number identifies each individual requirement included in this document. This requirement structure allows for easier requirement tracking and test case specification. The following format is used:

"[V2G"Y"-"XXX"]" requirement text Where:

— **"V2G"** represents the ISO/IEC°15118 set of standards,

— Y represents the document part of the ISO/IEC°15118 document set

— XXX represents the individual requirement number and

— "requirement text" includes the actual text of the requirement.

EXAMPLE   **[V2G2-000]**   This shall be an example requirement.

5.3 Usage of RFC references

When RFCs are referenced all "must/ must not" requirements are mandatory.

[V2G2-001]   In this document, if a referenced RFC has been updated by one or several RFC, the update is fully applicable.

[V2G2-002]   If an update or part of an update applicable to an RFC referenced herein is not compatible with the original RFC or the implementation described by this standard the update shall not apply.

[V2G2-003]   All published Errata, for the ISO/IEC°15118 referenced RFCs, are fully applicable in this standard.

5.4 Notation used for XML schema diagrams

This standard make use of XML as a description format for V2G messages. For details with regards to the XML schema diagram notation used in this document refer to Altova XMLSpy Manual.

Allowing for an easy way to distinguish the types used for the XML schema definitions in this standard following naming conventions apply:

— complex type use capitalized first letters

— simple types use non capitalized first letters

6   Document overview

Figure 2 describes the organization of the different ISO/IEC°15118 documents and the usage of the subclauses , according to the OSI layered architecture.