

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



---

**Standardized product ontology register and transfer by data parcels –  
Part 8: Web service interface for data parcels**

**Enregistrement d'ontologie de produits normalisés et transfert par paquets  
de données –  
Partie 8: Interface de service Web pour les paquets de données**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2020 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

#### **About the IEC**

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### **About IEC publications**

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### **IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### **IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### **IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### **Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### **IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

---

#### **A propos de l'IEC**

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### **A propos des publications IEC**

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### **Recherche de publications IEC - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### **IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### **Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### **Electropedia - [www.electropedia.org](http://www.electropedia.org)**

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### **Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



---

**Standardized product ontology register and transfer by data parcels –  
Part 8: Web service interface for data parcels**

**Enregistrement d'ontologie de produits normalisés et transfert par paquets  
de données –  
Partie 8: Interface de service Web pour les paquets de données**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 01.040.01; 01.110

ISBN 978-2-8322-8469-8

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	10
2 Normative references .....	10
3 Terms, definitions and abbreviated terms .....	11
3.1 Terms and definitions.....	11
3.2 Abbreviated terms.....	13
4 Use scenarios.....	13
4.1 Holistic use scenario.....	13
4.2 Use scenario between server and client.....	14
4.3 Use scenario between servers .....	15
5 Parcel web service specification .....	16
5.1 General.....	16
5.2 Exception.....	16
5.2.1 General .....	16
5.2.2 Naming convention for an exception .....	17
5.2.3 Standard-defined exceptions .....	17
5.3 Search scope.....	18
5.4 Parcel registration service.....	20
5.4.1 General .....	20
5.4.2 Request message .....	20
5.4.3 Response message .....	22
5.4.4 Exception .....	23
5.5 Parcel resolution service.....	23
5.5.1 General .....	23
5.5.2 Request message .....	24
5.5.3 Response message .....	27
5.5.4 Exception .....	27
5.6 Parcel subscription service .....	28
5.6.1 General .....	28
5.6.2 Request message .....	28
5.6.3 Response message .....	29
5.6.4 Exception .....	29
5.6.5 Specification of change notification.....	29
6 Specification of parcel data representation in a web service message .....	30
6.1 General.....	30
6.2 Basic data representation .....	30
6.3 Reserved keywords.....	31
6.3.1 Keyword indicating conjunctive parcels.....	31
6.3.2 Keyword indicating parcel ontology layer of a set of data parcels.....	31
6.3.3 Keyword indicating header section.....	31
6.3.4 Keyword indicating class header section.....	31
6.3.5 Keyword indicating schema header section.....	32
6.3.6 Keyword indicating data section.....	32
6.3.7 Keyword indicating default supplier in data section .....	32
6.3.8 Keyword indicating default version in data section .....	32

6.4	Additional instructions to data parcels for parcel web services .....	32
6.4.1	Codification mode .....	32
6.4.2	Intended language .....	33
6.4.3	Default value .....	33
6.5	Description of instructions .....	34
7	Data representation in JSON .....	35
7.1	Basic structure of data representation in JSON .....	35
7.2	Reserved JSON name indicating an array of data parcels .....	37
7.3	JSON names for class header section .....	37
7.3.1	JSON name indicating the instruction "#CLASS_ID" .....	37
7.3.2	JSON name indicating the instruction "#PARCEL_MODE" .....	37
7.3.3	JSON name indicating the instruction "#PARCEL_ID" .....	37
7.3.4	JSON name indicating the instruction "#DEFAULT_SUPPLIER" .....	37
7.3.5	JSON name indicating the instruction "#DEFAULT_VERSION" .....	38
7.3.6	JSON name indicating the instruction "#OBJECT_ID_NAME" .....	38
7.3.7	JSON name indicating the instruction "#ID_ENCODE" .....	38
7.3.8	JSON name indicating the instruction "#PWS_CODIFICATION_MODE" .....	38
7.3.9	JSON name indicating the instruction "#INTENDED_LANGUAGE" .....	38
7.4	JSON names for schema header section .....	38
7.4.1	Basic structure of data representation for schema header section in JSON .....	38
7.4.2	JSON names for the schema header section .....	39
7.5	Data representation for data section in JSON .....	40
7.5.1	Vertical JSON notation for data section .....	40
7.5.2	Lateral JSON notation for data section .....	40
7.6	Character encode .....	40
8	Data representation in XML .....	41
8.1	Basic structure of data representation in XML .....	41
8.2	Reserved keyword indicating data parcel .....	42
8.3	XML elements for class header section .....	42
8.3.1	XML element indicating the instruction "#CLASS_ID" .....	42
8.3.2	XML element indicating the instruction "#PARCEL_MODE" .....	42
8.3.3	XML element indicating the instruction "#PARCEL_ID" .....	42
8.3.4	XML element indicating the instruction "#DEFAULT_SUPPLIER" .....	42
8.3.5	XML element indicating the instruction "#DEFAULT_VERSION" .....	42
8.3.6	XML element indicating the instruction "#OBJECT_ID_NAME" .....	43
8.3.7	XML element indicating the instruction "#ID_ENCODE" .....	43
8.3.8	XML element indicating the instruction "#PWS_CODIFICATION_MODE" .....	43
8.3.9	XML element indicating the instruction "#INTENDED_LANGUAGE" .....	43
8.4	XML elements for schema header section .....	43
8.4.1	Basic structure of data representation for schema header section in XML .....	43
8.4.2	XML elements of schema header section .....	44
8.5	XML elements and attributes for data section .....	45
8.5.1	Vertical XML notation of data section .....	45
8.5.2	Lateral XML notation of data section .....	46
8.6	Character encode .....	48
Annex A (normative)	Schema .....	49
A.1	JSON schema .....	49

A.1.1	Vertical JSON schema .....	49
A.1.2	Lateral JSON schema .....	51
A.1.3	Exception JSON schema .....	53
A.2	XML schema .....	54
A.2.1	Vertical XML schema .....	54
A.2.2	Lateral XML schema .....	57
A.2.3	Exception XML schema .....	59
Annex B (normative)	Web service representation .....	60
B.1	Web service representation in WADL .....	60
B.2	Web service representation in WSDL .....	64
Annex C (informative)	Examples of data representation .....	68
C.1	Example data parcel .....	68
C.2	Example of data representation in JSON notation .....	69
C.2.1	Example of data representation in vertical JSON notation .....	69
C.2.2	Example of data representation in lateral JSON notation .....	70
C.3	Example of data representation in XML notation .....	71
C.3.1	Example of data representation in vertical XML notation .....	71
C.3.2	Example of data representation in lateral XML notation .....	73
Annex D (informative)	Descriptions of the instructions of "optional – informative" .....	75
Bibliography	.....	76
Figure 1	– Holistic use scenario of parcel web services .....	14
Figure 2	– Parcel resolution and registration services between a server and a client .....	15
Figure 3	– Parcel subscription service between registries .....	16
Figure 4	– Tree structure of exceptions .....	17
Figure 5	– Example of structural view of the use of search scope modifiers .....	19
Figure 6	– Example of a parcel sheet view of the use of search scope modifiers .....	20
Figure 7	– Overview of parcel resolution service .....	24
Figure 8	– Basic structure of a data representation for a conjunctive set of data parcels .....	31
Figure 9	– Example of the use of default values .....	34
Figure 10	– Basic structure of data representation in JSON .....	36
Figure 11	– Basic structure of data representation for schema header section in JSON .....	39
Figure 12	– Basic structure of data representation in XML .....	41
Figure 13	– Basic structure of data representation for schema header section in XML .....	44
Figure 14	– Structure of data representation for data section in the vertical XML notation .....	45
Figure 15	– Structure of data representation for data section in lateral XML notation .....	47
Figure A.1	– Vertical JSON schema .....	49
Figure A.2	– Lateral JSON schema .....	51
Figure A.3	– Exception JSON schema .....	53
Figure A.4	– Vertical XML schema .....	54
Figure A.5	– Lateral XML schema .....	57
Figure A.6	– Exception XML schema .....	59
Figure B.1	– Web service representation in WADL .....	60
Figure B.2	– Web service representation in WSDL .....	64

Figure C.1 – Example of data representation in vertical JSON notation..... 69

Figure C.2 – Example of data representation in lateral JSON notation ..... 70

Figure C.3 – Example of data representation in vertical XML notation..... 71

Figure C.4 – Example of data representation in lateral XML notation ..... 73

  

Table 1 – Standard-defined exceptions for parcel web services ..... 18

Table 2 – Specification of search scope modifiers..... 19

Table 3 – Structure of a request message of the parcel registration service ..... 20

Table 4 – Structure of a response message of the parcel registration service ..... 22

Table 5 – Structure of a request message of the parcel resolution service ..... 25

Table 6 – Structure of a response message of the parcel resolution service..... 27

Table 7 – Structure of a request message of the parcel subscription service..... 28

Table 8 – Structure of a response message of the parcel subscription service ..... 29

Table 9 – Specification of a notification..... 30

Table 10 – Description of the instructions specified in IEC 62656-1 ..... 35

Table 11 – Description of the instructions specified in this document ..... 35

Table C.1 – Example data parcel ..... 68

Table D.1 – Descriptions of the instructions of "optional – informative" ..... 75

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**STANDARDIZED PRODUCT ONTOLOGY REGISTER  
AND TRANSFER BY DATA PARCELS –**
**Part 8: Web service interface for data parcels**
**FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62656-8 has been prepared by subcommittee 3D: Classes, Properties and Identification of products – Common Data Dictionary (CDD), of IEC technical committee 3: Documentation, graphical symbols and representations of technical information.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
3D/342/FDIS	3D/346/RVD

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

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

A list of all parts in the IEC 62656 series, published under the general title *Standardized product ontology register and transfer by data parcels*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

For a description of products and services throughout their lifecycle, an enhanced data interoperability with reduced human interventions is an ultimate goal of developing international standards for intelligent production systems. In attaining this goal, an industrial ontology is expected to play a significant role by allowing components of systems to talk to each other, namely machine-machine understanding, about their functions, capabilities, structures and their configurations.

The parcellized ontology model defined in IEC 62656-1, also known by its acronym "POM", is a generic ontology model with quadruple layers to capture different types of ontology models by sorting elements into categories of homogeneous collection of ontological entities, such as classes (concepts), properties, relations, enumerations, terms (constants), data types, etc. At the second layer from the top, named the Meta-Ontology (MO) layer, 11 types of category are defined. Each layer is a collection of categories, while each category is represented by a relational table-like matrix called "data parcel" whose meta data (attributes) are embodied as a selection of instances of the immediate upper layer. The top layer of the POM, named the Axiomatic Ontology (AO) layer, comprises two data parcels only, which conjointly define the "concept of concepts" by classes and properties, which is an information technology (IT) embodiment of the math-logical notion of the class (i.e., "concept") itself.

Other parts of the IEC 62656 series, which are collectively known as "Parcel standards", are intended as a specialization of the POM for a specific purpose.

IEC 62656-2 [1]<sup>1</sup> is a guide for domain experts to apply the POM in order to capture a data dictionary from the definitions available in product standards in a form conformant to the IEC 61360-2 [2] and ISO 13584-42 [3] dictionary schema (i.e., common data dictionary model, or CDDM) and using the specification of a part of IEC 62656-1 as an official data interface for the IEC 61360-4 database known as the IEC CDD (Common Data Dictionary), enabling the uploading and downloading of the dictionary to and from the IEC CDD. A referential implementation of IEC 62656-1 is available as a tool, free of charge for standardization purposes.

IEC 62656-3 is intended as a mapping specification between a standard data model of the "Smart-Grid" domain, with acronym CIM (Common Information Model), and an extended, or rather generalized data model of the IEC CDD, namely, the POM. The CIM comprises the IEC 61968/IEC 61970/IEC 62325 series of International Standards. Thus, the IEC CDD can accommodate the CIM provided the IEC CDD sufficiently implements the POM as the data interface or database. Alternatively, this mapping inevitably entails a small but significant extension of the IEC CDD, without which the accommodation of the CIM into the IEC CDD is infeasible. Nevertheless, nothing needs to be added to or subtracted from the tool which is currently used as a data interface for the IEC CDD and which fully embodies IEC 62656-1.

IEC 62656-5 is intended as an interface for the description of activities as an ontology conformant to IEC 62656-1, thus opening a way to store definitions available from activity-centric International Standards, for instance IEC 62224-3, as an ontology. IEC 62656-5 can also be applied to the description of non-manufacturing use scenarios, such as for the description of activities of natural hazard management or electronic tourist guidance or navigation, with a harmonious integration of activities with related products and services.

This means a common ontology repository ("COR") based on the POM can store both IEC CDD and CIM types of data dictionaries or ontologies. Furthermore it can smoothly bridge the differences and fill the gaps covering ontologies of different provenances.

---

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

Future parts of the IEC 62656 series are expected to shed light on a new spectrum of applications for the COR based on the POM.

Above all, this document specifies a description of basic web services for semantic repositories based on the POM, whilst an advanced type of web interface, including complex enquiry about products as well as query forwarding to another repository, is left to a future part of the series, to be developed.

# STANDARDIZED PRODUCT ONTOLOGY REGISTER AND TRANSFER BY DATA PARCELS –

## Part 8: Web service interface for data parcels

### 1 Scope

This part of IEC 62656 specifies a web service interface to exchange data parcel(s) conformant to IEC 62656-1, between a parcel server and a parcel client or between parcel servers. This interface comprises three basic services: a registration service, resolution service and subscription service.

This document includes the following:

- holistic use scenario;
- detailed specification of the three basic services;
- JSON [1] and XML [5] notation schemas for data parcel(s).

The following items are outside the scope of this document:

- user identification and authorization;
- query language for a data parcel;
- transportation protocol;
- data and communication security techniques.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62656-1:2014, *Standardized product ontology register and transfer by spreadsheets – Part 1: Logical structure for data parcels*

ISO/IEC 21778, *Information technology – The JSON data interchange syntax*

ISO 639-1, *Codes for the representation of names of languages – Part 1: Alpha-2 code*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*

ISO 8601-1, *Date and time – Representations for information interchange – Part 1: Basic rules*

ISO 8601-2, *Date and time – Representations for information interchange – Part 2: Extensions*

ISO 13584-32, *Industrial automation systems and integration – Parts library – Part 32: Implementation resources: OntoML: Product ontology markup language*