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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Standardized product ontology register and transfer by spreadsheets – Part 3: Interface for Common Information Model

Enregistrement d'ontologie de produits normalisés et transfert par tableurs – Partie 3: Interface pour un modèle d'information commun

IEC 62656-3:2015-02(en-fr)

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CONTENTS

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STANDARDIZED PRODUCT ONTOLOGY REGISTER AND TRANSFER BY SPREADSHEETS –

Part 3: Interface for Common Information Model

FOREWORD

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International Standard IEC 62656-3 has been prepared by subcommittee 3D, Product properties and classes and their identification, of IEC technical committee 3: Information structures, documentation and graphical symbols.

The text of this standard is based on the following documents:

FDIS	Report on voting
3D/234/FDIS	3D/245/RVD

Full information on the voting for the approval of this standard 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 62656 series, published under the general title *Standardized product ontology register and transfer by spreadsheets*, 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- withdrawn,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
- amended.

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INTRODUCTION

The IEC 62656 series, *Standardized product ontology register and transfer by spreadsheets* is a series of International standards that collectively define the methods for transferring and registering the ontologies of various products and services to and from the ontology registries and applications based on IEC 61360 / ISO13584 common data dictionary model. The IEC common data dictionary, or IEC CDD for short, is one of such registries maintained online as an IEC 61360-4 International Standard based on IEC database procedure stipulated in ISO/IEC Directives Supplement – Procedures specific to IEC. The IEC CDD is a cross-domain data dictionary covering all electro-technical products and services, maintained and updated through a database administered by IEC Central Office.

The common information model originally defined in IEC 61968 and IEC 61970 series of standards, often called by its short name “CIM” provides a standard way to represent all the major objects in an electric utility enterprise typically needed to model the operational aspects of a utility. This model includes public classes and attributes for these objects, as well as the relationships between them. It is known as an information model for energy management system (EMS) of power grids and currently is recognized as a standard ontology model for smart grids. An ontology specification conformant to the CIM data model is available in UML format according to IEC 61970-301, and in RDF format according to IEC 61970-501.

The IEC 62656 series consists of the following parts, under the general title *Standardized product ontology transfer and register by spreadsheets*:

– Part 1: Logical structure for data parcels;
– Part 2: Application guide for use with the IEC common data dictionary (CDD);
– Part 3: Interface for common information model.

STANDARDIZED PRODUCT ONTOLOGY REGISTER AND TRANSFER BY SPREADSHEETS –

Part 3: Interface for Common Information Model

1 Scope

This part of IEC 62656 specifies an interface between IEC 62656 series and meta-model for CIM originally defined in IEC 61968 and IEC 61970 series of standards. The current CIM includes IEC 62325 series and the interface specified in this part of IEC 62656 also applies to the model defined in IEC 62325-301:2014. More specifically, this standard defines a formal mapping between the IEC 62656 and meta-model for CIM in order to import the CIM ontology into the IEC CDD, and to ensure the interoperability of ontologies of two standards, or even among a wider spectrum of standards. For the basis of the mapping from CIM to the data model defined in IEC 62656-1, the UML representation of CIM is referenced.

As a result of the interface specification available from this part of IEC 62656, the smart grid ontology defined in CIM becomes accessible and interoperable in the midst of ontology pieces originating in other ontology standards, encompassing material, environmental, and mechanical, and logistic domains of information. In addition, the specification may also cover the lifecycle of products.

This part of IEC 62656 also defines methods for transforming the IEC CDD content into the format defined in IEC 61968 and IEC 61970 series. However, this standard does not intend any standardization of the elements defined in IEC CDD as part of the CIM ontology, for all the definitions of IEC CDD are already part of an acknowledged horizontal International Standard known as IEC 61360-4-DB. Rather it makes the pieces of information stored in IEC CDD available for further standardization or customization in power electric domains or more specific user communities as a basic resource, in particular for the purpose of extending the CIM series of standards.

The data model of this part is based on IEC 62656-1 which specifies the logical structure for a data parcel, or just simply “parcel,” that is a short name for the medium of registering or transferring of product ontology. Such a parcel may be typically implemented in a leaf of a spreadsheet. The data model built on a set of parcels is called “parcellized ontology model”, which is often abbreviated as “POM” in the remainder of this document.

This part of IEC 62656 specifies:

- the mapping rules and principles for importing CIM UML objects into POM;
- the syntactic and semantic requirements on the parcellized CIM objects;
- the piecewise version control mechanism in POM for the parcellized CIM objects.

The following items are outside the scope of this part of IEC 62656:

- definition of the interface between CIM UML and CIM RDF;
- specification of syntactic and semantic requirements on CIM UML;
- specification of syntactic and semantic requirements on CIM RDF.

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 62656-1:2014, *Standardized product ontology register and transfer by spreadsheets – Part 1: Logical structure for data parcels*

IEC 61360-1:2009, *Standard data elements types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods*

IEC 61360-4, *Standard data element types with associated classification scheme for electric components – Part 4: IEC reference collection of standard data element types, component classes and terms*, available from <http://std.iec.ch/iec61360>

IEC 61968-1:2003, *System interfaces for distribution management – Part 1: Interface architecture and general requirements*

IEC 61968-11:2010, *System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*

IEC 61970-1:2005, *Energy management system application program interface (EMS-API) – Part 1: Guidelines and general requirements*

IEC 61970-2:2004, *Energy management system application program interface (EMS-API) – Part 2: Glossary*

IEC 61970-301:2013, *Energy management system application program interface (EMS-API) – Part 301: Common Information Model(CIM) base*

IEC 61970-501:2006, *Energy management system application program interface(EMS-API) – Part 501: Common Information Model Resource Description Framework(CIM RDF) schema*

IEC 62325-301:2014, *Framework for energy market communications – Part 301: Common information model (CIM) extensions for markets*

ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*

ISO 8601:2004, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ISO/IEC Directives Supplement:2013, *Procedures specific to IEC*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 61970-2 and IEC 62656-1, as well as the following apply.

3.1.1
attribute

a) attribute defined in IEC 62656-1, equivalent to a meta-property

b) attribute of class used in IEC 61970-301 corresponding to a property in POM

c) attribute of enumeration used in IEC 61970-301 corresponding to a term in POM

Note 1 to entry: In case of b), it is more specifically called as “CIM attribute” or “CIM class attribute” in this standard

3.1.2
aggregationKind
kind of the UML association comprising normal association, aggregation and composition.

Note 1 to entry: Possible value of aggregationKind is “none” for normal association, “shared” for aggregation and “composition” for a composition, the same as ISO/IEC 19505-2:2012 definitions.

3.1.3
CIM multiplicity at the source
multiplicity of the instances of the class located at the source side of the two classes connected by an association

3.1.4
CIM basic data type
basic data type defined in the CIM comprising String, Boolean, Float and Integer

Note 1 to entry: In CIM edition, there are other basic data types available for use

3.1.5
CIM object

class, attribute, package, or relationship defined in series of IEC 61970, IEC 61968 and IEC 62325 series to represent power system resources

3.1.6
CIM package
general-purpose means of grouping related model elements of CIM

Note 1 to entry: CIM Package is a synonymous name assigned to the Segment(MDC_P211) attribute of IEC 62656-1:2014

3.1.7
CIM UML ID
ID of each CIM object, assigned by a UML tool by which the object is designed

3.1.8
INVERSIBLE_P_DET
INVERSIBLE_PROPERTY
kind of property data element type that can depend on the same type of property

Note 1 to entry: A UML association with unspecified navigability is defined with INVERSIBLE_P_DET because the navigability may be assigned in the future

3.1.9
navigability
state of accessibility of the instances of a class at one end of an association from the instances of the class at the other end of the association.

Note 1 to entry: In this standard, the navigability of bidirectional, unidirectional and unspecified is distinguished.

3.1.10
parcellized CIM
collection of CIM objects translated into and represented by a set of spreadsheets conformant to the POM objects defined in IEC 62656-1, with an extended list of attributes added in this part of the standard

3.1.11
POM object
set of objects defined by a meta-class of IEC 62656-1:2014 and used in this part of IEC 62656.

EXAMPLE Class, property, datatype, enumeration, unit, term and relation.

3.1.12
property

a) instance of property meta-class, or the meta-class per se as schema; defined in IEC 62656-1

b) property defined in IEC 61970-2 that represents a specific aspect, characteristic, attribute or relation used to describe a network resource

Note 1 to entry: To clearly distinguish between these two cases, in case of a), it is called “POM property” or “property in POM”. In case of b),it is called “CIM property” in this part of IEC 62656; whenever necessary.

3.2 Abbreviations

For the purposes of this standing document, the following abbreviations apply.

CIM	common information model
IEC CDD	IEC common data dictionary
POM	parcellized ontology model
RDF	resource description framework
RDFS	resource description framework schema
UML	unified modeling language
XML	extensible markup language

4 Generic rules and principles for the design of CIM interface

4.1 Comparative analysis of the structures and functionalities of POM and CIM

The current CIM is modelled with the UML which is widely accepted among IT engineers for designing concepts of products and services. Thus UML is used as a convenient design tool to model the CIM. However, from the users' perspective, the current CIM modelled in UML is totally devoid of mechanism to locally update or extend the entities of the model on an entity-by-entity basis, while the POM is adequately equipped to record the history of changes in a continuous manner. In other words, the current CIM standard is designed to update the model as a whole in a file at once. However, this poses a significant obstacle to the maintenance of the model as an ontology in a database and to the updates of the elements of the database on an individual basis. Since every update shall entail a holistic change of the model, and such a change will disrupt the operation of the objects already installed and used in various applications and systems.

To address this concern, an advanced framework for ontology maintenance and change management for the elements of the ontology in a database form is required, which shall be equipped with;

a) ontology evolution management

b) ontology extension mechanism

c) hierarchy management for both the specialisation (is-a) and composition (has-a).

The above three requirements are fully met by POM, while the CIM in UML or in RDF is designed for other requirements and objectives.

Moreover, by scope, the CIM concentrates on information exchange among electric-power related systems and products, thus the information covered by IEC 61968, IEC 61970 and IEC 62325 series is not complete for describing the whole range and life-cycle of the products and services used in the power grids: Namely, manufacturing, installation, maintenance, transport, and disposal related characteristics of the products and services are not covered. Although some parts of IEC 61968 and IEC 62325 series are intended to relate pieces of information of different domains, they do not and cannot standardize the entire domains of electro-technical ontology, simply because such is not within the scope of one domain TC/SC.