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Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base

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FOREWORD

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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.

International Standard IEC 61970-301 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2005. This edition constitutes a technical revision [1)].

The second edition contains the following changes from the first edition:

- First edition Annex A which contained the description of the CIM UML model is now a part of the main body of the standard – Clauses 5 and 6.

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1) Note that the third edition with the updates made to the CIM UML model in 2007 will be available shortly after publication of this second edition. For the third edition of this publication the units will be based on the "International System of Units" (SI).

- A new Annex A was added providing a model of a circuit breaker in the CIM as an example of how the CIM can be used to model network devices.
- Significantly reorganized and expanded Subclause 4.4 Examples to explain:
  - Containment, equipment hierarchies, connectivity, and naming
  - Measurements and controls
  - Role of the new IdentifiedObject class, which replaces the old Naming class.
- The naming hierarchy was changed. New classes GeographicalRegion and SubGeographicalRegion replaced HostControlArea and SubControlArea.
- ModelingAuthority and ModelingAuthoritySet classes were added to represent ownership of models. A ModelingAuthority is a role responsible for a model and is used to break down a large model in manageable pieces with clear ownership.
- A new schedules data model was added to replace the use of the curve model for time series data. New base classes IrregularSchedule and RegularSchedule replaced the class CurveSchedule.
- The measurement value attributes were sub-typed into classes Analog, Discrete and Accumulator.
- The class naming was renamed to IdentifiedObject.
- The Line class was changed to be a specialization of the classes Equipment and EquipmentContainer, so that Line is now a container able to contain all necessary objects to model multiple interconnected ACLineSegments as found in the real world.
- Many editorial corrections, including several cardinality and attribute changes to resolve issues submitted on the first edition.

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

FDIS	Report on voting
57/986/FDIS	57/995/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.

A list of all parts of the IEC 61970 series, under the general title: *Energy management system application program interface (EMS-API)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This standard is one of the IEC 61970 series which define an application program interface (API) for an energy management system (EMS). This standard was originally based upon the work of the EPRI control center API (CCAPI) research project (RP-3654-1). The principle objectives of the EPRI CCAPI project were to:

– reduce the cost and time needed to add new applications to an EMS,
– protect the investment of existing applications or systems that are working effectively with an EMS.

The principal objective of the IEC 61970 series of standards is to produce standards which facilitate the integration of EMS applications developed independently by different vendors, between entire EMS systems developed independently, or between an EMS system and other systems concerned with different aspects of power system operations, such as generation or distribution management systems (DMS). This is accomplished by defining application program interfaces to enable these applications or systems access to public data and exchange information independent of how such information is represented internally.

The common information model (CIM) specifies the semantics for this API. The component interface specifications (CIS), which are contained in other parts of the IEC 61970 standards, specify the content of the messages exchanged.

The CIM is an abstract model that represents 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.

The objects represented in the CIM are abstract in nature and may be used in a wide variety of applications. The use of the CIM goes far beyond its application in an EMS. This standard should be understood as a tool to enable integration in any domain where a common power system model is needed to facilitate interoperability and plug compatibility between applications and systems independent of any particular implementation.

IEC 61970-301 defines the CIM base set of packages which provide a logical view of the physical aspects of an energy management system including SCADA (Supervisory Control and Data Acquisition). IEC 61968 series of standards describes additional parts of the CIM that deal with other logical views of utility operations including assets, location, activities, documentation, and work management. However, while there are multiple IEC standards dealing with different parts of the CIM, there is a single, unified normalized information model comprising the CIM behind all these individual standards documents.

International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning a computer-based implementation of an object-oriented power system model in a relational database. As such, it does not conflict with the development of any logical power system model including the Common Information Model (CIM), where implementation of the model is not defined.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured IEC that it is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holders of these patent rights is registered with IEC. Information may be obtained from:

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Wenlock Way

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United Kingdom (U.K.)

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAM INTERFACE (EMS-API) –

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1 Scope

The common information model (CIM) is an abstract model that represents all the major objects in an electric utility enterprise typically involved in utility operations. By providing a standard way of representing power system resources as object classes and attributes, along with their relationships, the CIM facilitates the integration of energy management system (EMS) applications developed independently by different vendors, between entire EMS systems developed independently, or between an EMS system and other systems concerned with different aspects of power system operations, such as generation or distribution management. SCADA is modeled to the extent necessary to support power system simulation and inter-control center communication. The CIM facilitates integration by defining a common language (i.e. semantics and syntax) based on the CIM to enable these applications or systems to access public data and exchange information independent of how such information is represented internally.

The object classes represented in the CIM are abstract in nature and may be used in a wide variety of applications. The use of the CIM goes far beyond its application in an EMS. This standard should be understood as a tool to enable integration in any domain where a common power system model is needed to facilitate interoperability and plug compatibility between applications and systems independent of any particular implementation.

Due to the size of the complete CIM, the object classes contained in the CIM are grouped into a number of logical packages, each of which represents a certain part of the overall power system being modeled. Collections of these packages are progressed as separate International Standards. This particular International Standard specifies a base set of packages which provide a logical view of the physical aspects of energy management system (EMS) information within the electric utility enterprise that is shared between all applications. Other standards specify more specific parts of the model that are needed by only certain applications. Subclause 4.2 below provides the current grouping of packages into standards documents.

2 Normative references

The following referenced documents are indispensable 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 60870 (all parts), *Telecontrol equipment and systems*

IEC 61850 (all parts), *Communication networks and systems in substations*

IEC 61850-7-3, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes*

IEC 61968 (all parts), *Application integration at electric utilities – System interfaces for distribution management*

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

IEEE 754-1985, Standard for Binary Floating-Point Arithmetic