IEC 61970-453

Edition 2.1 2018-11
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Energy management system application program interface (EMS-API) – Part 453: Diagram layout profile

Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 453: Profil de disposition de diagramme

IEC 61970-453:2014-02+AMD1:2018-11 CSV(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.200

ISBN 978-2-8322-6324-2

IEC 61970-453

Edition 2.1 2018-11

REDLINE VERSION

VERSION REDLINE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 453: Diagram layout profile

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61970-453 edition 2.1 contains the second edition (2014-02) [documents 57/1409/FDIS and 57/1430/RVD] and its amendment 1 (2018-11) [documents 57/2038/FDIS and 57/2054/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61970-453 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This edition includes the following significant technical changes with respect to the previous edition:

a) The SVG elements and its data model have been replaced by the Diagram Layout Package, which is now an integral part of the IEC 61970-301 (CIM) model.
b) The exchange is in accordance with and is a part of the IEC 61970 profile concept.
c) A glue point object has been introduced to model explicit connections between graphics elements.

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

A list of all parts in the IEC 61970 series, published 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 stability 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.

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

This standard is part of the IEC 61970 series that define an application program interface (API[1]) for an Energy Management System (EMS[2]).

The IEC 61970-3x series specify a Common Information Model (CIM[3]): a logical view of the physical aspects of EMS information. The IEC 61970-3x series includes IEC 61970-301, *Common Information Model (CIM) Base*.

This standard is one of the IEC 61970-4x series that define utility control centre component interface specifications (CIS[4]). IEC 61970-4x specifies the functional requirements for interfaces that a component (or application) shall implement to exchange information with other components (or applications) and/or to access publicly available data in a standard way. The component interfaces describe the specific message contents and services that can be used by applications for this purpose. The implementation of these messages in a particular technology is described in the IEC 61970-5x series.

Energy Management Systems employ a variety of schematic and quasi-geographic presentations in their user interfaces. These are sometimes generated automatically, but more often are hand-drawn and require considerable labour to create and maintain. Most of this labour goes into the arrangement, or 'layout' of the power system elements within the overall diagram. When network models are exchanged, as defined in IEC 61970-452 and IEC 61968-13 standards, it is desirable to be able to exchange these layouts.

IEC 61970-453 specifies guidelines for the exchange of diagram layout information for schematic data that is encoded using IEC 61970-552.

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1 Footnote 1 applies to the French version only.

2 Footnote 2 applies to the French version only.

3 Footnote 3 applies to the French version only.

4 Footnote 4 applies to the French version only.

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

Part 453: Diagram layout profile

1 Scope

This part of IEC 61970 is a member of the IEC 61970-450 to 499 series that, taken as a whole, defines, at an abstract level, the content and exchange mechanisms used for data transmitted between control centre components.

Included in this part of IEC 61970 are the general use cases for exchange of diagram layout data, and guidelines for linking the layout definitions with CIM data. Guidelines for management of schematic definitions through multiple revisions are also included.

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 60050, *International electrotechnical vocabulary*

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

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

IEC/TR 62541-1, *OPC Unified Architecture – Part 1: Overview and concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050, as well as the following, apply.

3.1
domain object[5]
instance of a class that models a Real-World Object[6] with a unique identity

Note 1 to entry: A domain object inherits from a CIM *IdentifiedObject.* A domain object is normally not a diagram object.

3.2
diagram[7]
electronic equivalent of a seamless paper plan

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5 Footnote 5 applies only to the French version.

6 Footnote 6 applies only to the French version.

7 Footnote 7 applies to the French version only.

Note 1 to entry: The diagram is an identified container for the diagram objects. Examples of diagrams include substation schematics, transportation or distribution network orthogonal schematics, or pseudo-geographical schematics. A diagram has a well-defined coordinate space.

3.3
diagram object[8]
representation of domain objects or static background

Note 1 to entry: The diagram is composed of diagram objects.

Note 2 to entry: An example for domain objects includes breakers. An example for static background object includes lakes.

3.4
diagram object style
definition of how to render diagram objects possibly based on the state of domain objects

Note 1 to entry: Typically, the diagram object style is resolved in a very specific way for each system.

4 Use Cases

4.1 General use cases for diagram exchange

Figure 1 shows a high-level view of using diagram layout data exchange with potential systems that can make use of the diagram layout data.

8 Footnote 8 applies to the French version only.

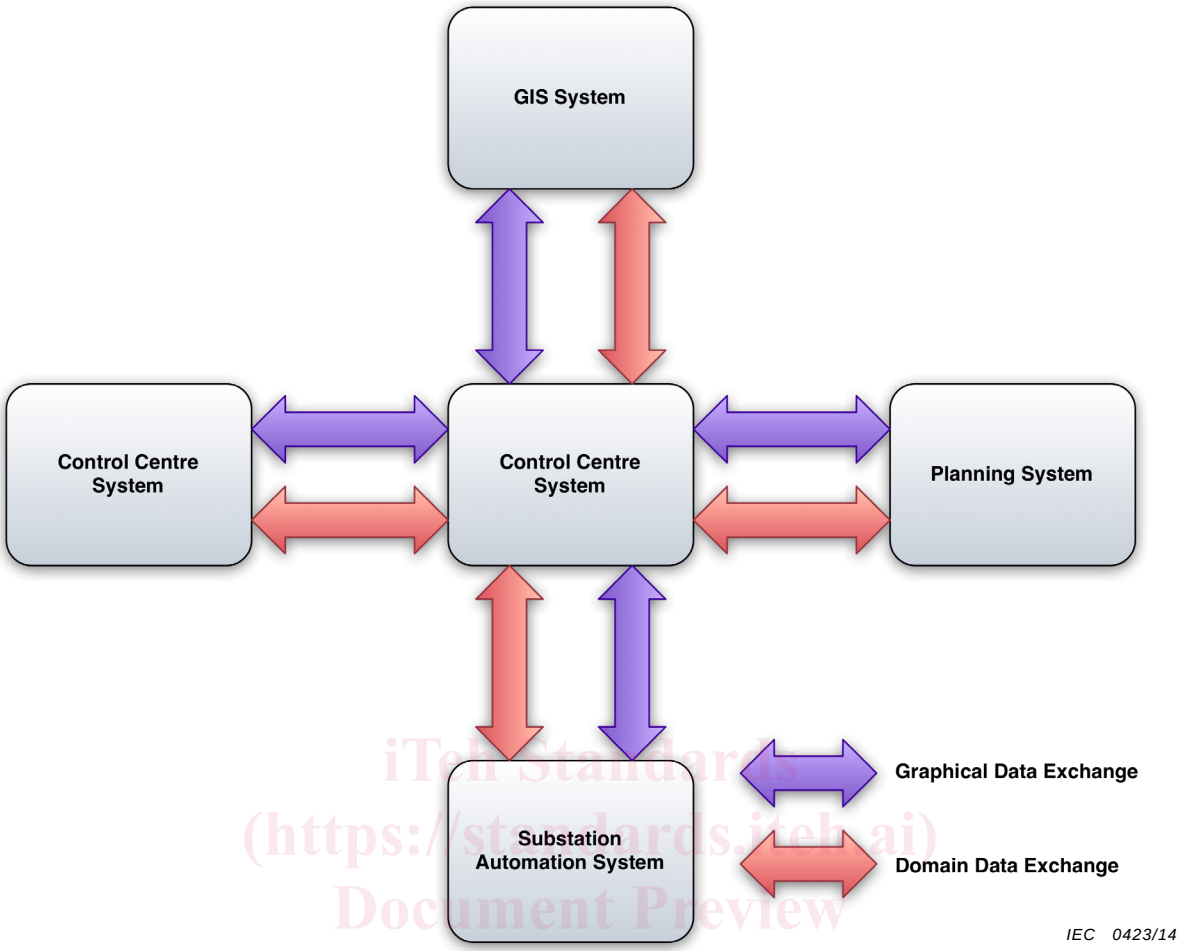

Figure 1 – System overview

An examination of the use cases for such exchanges revealed that the diagrams being exchanged are not fixed graphic presentations. Instead the diagrams vary considerably in appearance as attributes of CIM objects change, and they support important user interaction. For example, a SCADA one-line in its creator's system is supporting live control of the power system, while in a receiver's system it is merely used for reference so that a neighbour can understand what the system looks like beyond its own border. These variations are typically not easy or appropriate to map between the source and receiving systems because of the degree of difference in the way those systems are designed.

In the specification of diagrams, one common element is that the style of displaying an object of a certain kind is usually defined once and then re-used, but the placement of objects must be adjusted whenever new elements are added to the data model. This placement and maintenance of placement is where most of the labour investment takes place that users would like to preserve. As a result, this standard is limited to the exchange of diagram layouts (meaning the arrangement of CIM objects in a display space) rather than a complete exchange of all characteristics of a graphic presentation.

With this proposed standard, instead of maintaining duplicate schematics for different applications, the schematics are exported by one system and imported by the other system. Diagram layout profile is an extension to the CIM power system model exchange IEC 61970-452, and will be orchestrated along with the existing CIM XML model exchange and updates provided using the existing CIM XML Incremental file format as defined in IEC 61970-552. IEC 61970-552 also describes how payload headers provide information as to how payloads fit together.

This process can be applied for initial schematics construction as well as for continuous maintenance.

The importing system can create its graphics displays from the imported data, or the diagram layout data can serve as additional documentation and means of understanding for the domain data exchange.

4.2 Simple bay diagram example

Diagrams are constructed using different approaches. This subclause illustrates this using a simple bay drawing. Figure 2 shows a typical representation of a bay.

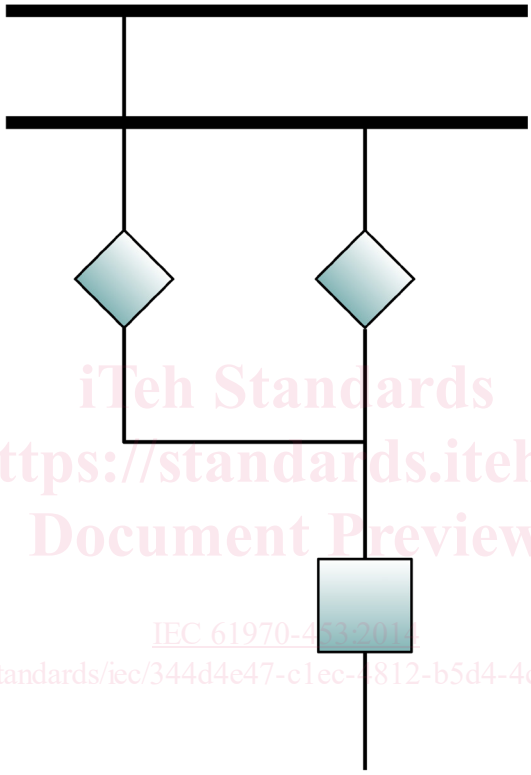

Figure 2 – Bay diagram as rendered

In a GIS system, lines are typically drawn up to the centre point of the symbol. This is shown in Figure 3 (transparent symbol is used for illustration). This construction method is independent if the symbol size, i.e. the drawing looks “pretty” even when the importing system used a smaller symbol size than the original one.