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Energy management system application program interface (EMS-API) – Part 403: Generic data access

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

Part 403: Generic data access

FOREWORD

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International Standard IEC 61970-403 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

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

FDIS	Report on voting
57/929/FDIS	57/948/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.

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

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- withdrawn;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 parts that define services for utility operational systems. This standard is based upon the work of the Electric Power Research Institute (EPRI) Control Center API (CCAPI) research project (RP-3654-1).

The IEC 61970-4xx series specifies a set of interfaces that a component (or application) should implement to be able to exchange information with other components and/or access publicly available data in a standard way. The 61970-4xx series component interfaces describe the specific event types and message contents that can be used by applications independent of any particular component technology. The implementation of these messages using a particular component technology is described in the 61970-5xx series of documents. Thus, IEC 61970-4xx documents describe a Platform Independent Model (PIM), while IEC 61970-5xx documents describe a Platform Specific Model (PSM).

IEC 61970-403 Generic Data Access (GDA) defines services that are needed to access public entity objects for the power system domain that are defined in the IEC 61970-3xx series: Common Information Model (CIM). GDA permits a client to access data maintained by another component (either an application or database) or system without any knowledge of the logical schema used for internal storage of the data. Knowledge of the existence of the common model is sufficient.

This request and reply oriented service is intended for synchronous, non-real time access of complex data structures as opposed to high-speed data access of SCADA data, for example, which is provided by IEC 61970-404, High Speed Data Access. An example where the GDA would be used is for bulk data access of a persistent store to initialise an analysis application with the current state of a power system network, and then storage of the results with notification.

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

Part 403: Generic data access

1 Scope

This International Standard provides a generic request/reply-oriented data access mechanism for applications from independent suppliers to access CIM data in combination with IEC 61970-402: Common Services. An application is expected to use the Generic Data Access (GDA) service as part of an initialisation process or an occasional information synchronization step. GDA is generic in that it can be used by an application to access any CIM data. GDA is also generic in that it also provides a back end storage mechanism independent query capability that can be used to facilitate the creation of CIM data warehouses.

This specification provides a simple, concise service that meets the functionality requirements of current and future applications while:

- avoiding unnecessary complexity;
- not requiring any specific database technology for implementation.

This service is designed to support interaction where the application or system requesting information is developed, supplied, maintained, or operated by a separate agency from the application supplying the data. Furthermore, the update portion of this service assumes that it is undesirable for one system to directly write into another[1)]. To support these objectives, the GDA capabilities are divided into three categories:

a) read access;
b) update access;
c) change notification events.

It should be noted that the update portion of this service does not support unconditional access to critical real-time data. Rather, the update portion allows a requesting application to ask for data to be changed in a service provider, but the service provider is under no obligation to carry out that change at any particular time. Furthermore, a positive response from the update service does not indicate that the update has occurred, but only that the service provider has successfully received the request and that the request is syntactically and semantically correct.

GDA could be classified as an Enterprise Information Integration (EII) technology adapter specialized to the power industry via the assumed use of the CIM. There are a number of EII products currently available on the market, but there is no accepted cross-platform standard for writing connectors for these products and overall these products do not take full advantage of a common semantic model such as the CIM. In recommending GDA, WG 13 is recommending a standard EII connector model in the form of a simpler, less expensive, and more specialized interface.

1) For more information on how 61970 excludes direct control of one application by another, see IEC 61970-402 Annex C: The IEC 61970 services and mapping IEC 61968 verbs.

Though the target of this IEC standard includes the utility control center technical domain, generic data access encompasses a general set of concepts that can be applied to many types of systems. Examples of these systems include:

- Energy and distribution management systems
- Work and asset management systems
- Geographic information systems
- Outage management systems
- Other types of technically oriented operational business systems.

In recognition that the integration between applications in two or more of these systems is often necessary, the intent of this specification is to address general GDA requirements to the extent that they are common to different types of systems while effectively addressing utility operation application specific needs.

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

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

IEC 61970-401, *Energy management system application program interface (EMS-API) – Part 401: Component interface specification (CIS) framework*

IEC 61970-402, *Energy management system application program interface (EMS-API) – Part 402: Component interface specification (CIS) – Common services*

OMG, Utility Management System Data Access Facility, document formal/2002-11-08

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61970-2 apply.

NOTE Refer to International Electrotechnical Vocabulary, IEC 60050, for general glossary definitions.

4 Background

This part of IEC 61970 specifies Component Interface Specifications (CIS) for Energy Management Systems Application Program Interfaces (EMS-API). It specifies the interfaces that a component (or application) shall implement to be able to exchange information with other components (or applications) and/or to access publicly available data in a standard way (see IEC 61970-1 for an overview of these standards). The goal of the creation of this document is to improve the interoperability of utility operational applications and systems. This specification provides a mechanism for applications from independent suppliers to access 61970 Common Information Model (CIM) data using a common service for the purpose of supplementary processing, storage, or display.

In IEC 61970-401, the CIS Framework provides an overview of the CIS documents in the IEC 61970-4xx series. It explains the separation of these specifications into two major groups. One group of standards, IEC 61970-402 to IEC 61970-449[2)], defines a set of generic application independent services that a component shall use for exchanging information with another component or for accessing public data. Added "However, as the generic interfaces do not specify what specific data is exchanged, interoperability between products using IEC 61970 402-449 is not guaranteed." The other group, IEC 61970-450 to IEC 61970-499, defines the information content conveyed using the generic services that a particular component or system exchanges with other components. While IEC 61970-402 to IEC 61970-449 specify application category independent message exchange mechanisms, IEC 61970-450 to IEC 61970-499 specify application category dependent CIM derived message contents.

As explained in IEC 61970-401, a major aspect of the IEC 61970-4xx series is that they take maximum advantage of existing industry standards. Of particular importance are standards developed by the OPC (originally OLE for Process Control) and OMG (Object Management Group). However, these standards are missing a certain functionality considered important for the environment in which the 61970 standards will be applied.

IEC 61970-402 provides the base functionality considered necessary and common that is provided by neither the normative standards incorporated by reference nor the new APIs specified in the IEC 61970-403 to IEC 61970-449 generic interface standards. An application is expected to use the Common Services in conjunction with the generic interfaces. These generic application category independent interfaces include this document as well as:

- IEC 61970-404: High Speed Data Access (HSDA)
- IEC 61970-405: Generic Eventing and Subscription (GES)
- IEC 61970-407: Time Series Data Access (TSDA)

IEC 61970-403 Generic Data Access (GDA) defines services that are needed to access public entity objects for the power system domain that are defined in the IEC 61970-3xx series: Common Information Model (CIM). GDA permits a client to access data maintained by another component (either an application or database) or system without any knowledge of the logical schema used for internal storage of the data. Knowledge of the existence of the common model is sufficient.

5 GDA read access

5.1 General

This specification describes two forms for GDA read access. The first, originally standardized within the OMG as the Utility Management System (UMS) Data Access Facility (DAF), provides clients a basic ability to query for instance data and metadata. The second extends UMS DAF to provide clients a more advanced ability whereby clients can perform more advanced query filtering and joining.

5.2 Read access requirements

GDA read access requirements address the problem of obtaining data from an operational data store on a read-only basis. This includes information describing a real or simulated state of the system together with the system's model data. GDA read access should be sufficient for integrating many applications and systems in a near-real-time or non-real-time mode.

2) At this time, only parts 402 to 408 exist. Additional generic services beyond are not yet under consideration.

Target applications expected to use this interface are listed in the draft IEC 61970-401 CIS Framework document. The requirements for the Read Access interface are:

a) Interfaces shall define a standard way to access data appropriate to utility operational systems in general.

b) Interfaces shall support navigation and access to instance data and metadata within a single CIM context from:

- third party near-real-time applications developed independently of the GDA read access provider, including analysis and decision support applications;
- foreign systems that require input from the GDA read access provider on a near-real-time or non-real-time basis, such as other control systems, customer management systems, trading systems and asset management systems.

c) The facility shall provide access to data organized in a complex schema (in particular the CIM) which contains:

- multiple classes of data. Models may contain between one hundred and one thousand classes;
- class attributes belonging to a variety of fundamental types including boolean, integer, floating point, string, and time;
- reference relationships, which may be single or many-valued;
- inheritance relationships.

d) Interfaces shall provide an efficient means to obtain and join large groups of related data, such as selected attribute values for multiple instances. A filtering capability shall be provided to limit the amount of data returned when querying large systems.

e) Interfaces shall not *require* the use of query. It must be possible to implement the facility for a wide range of extent systems, and most of these do not support a standard query language for their real-time data. That is, a GDA provider does not necessarily need to provide a means to query schema to offer a meaningful implementation. For example, applications that are aware of the CIM data model and terminology a priori and use it directly in the API to make direct requests for data do not need a schema query capability.

f) Interfaces shall support a form of read transaction. When a read transaction is used to bracket a series of data access operations, the data obtained are self-consistent and in some sense defined by the underlying system.

g) Interfaces shall take the form of a mapping that can accommodate future change in the CIM. The mapping shall define how classes, attributes and associations in the CIM correspond to constructs or usage patterns in the proposed interfaces.

h) Interfaces shall provide a means to query and join normalized and de-normalized CIM data. That is, it shall be possible to retrieve CIM data where the constructs or usage patterns consist of de-normalized views of CIM data.

i) Interfaces shall define GDA in a manner that supports programming language independence.

j) The GDA shall not include any services that do not provide for implementation independence.

k) It must be possible to access CIM data via the standard mapping in the same way irrespective of the underlying CIM implementation.

l) The interface should be simple and easy to implement to enable standardization and encourage implementation by suppliers and integrators.